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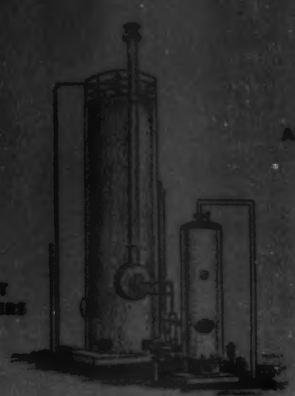

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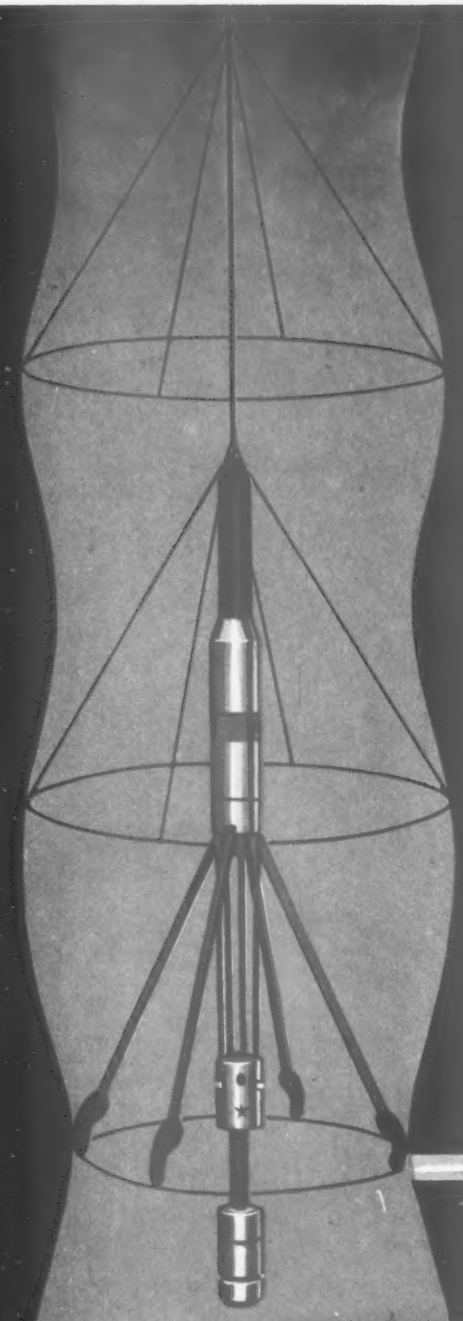

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Table of Contents

NEWS DEVELOPMENTS

"Keep Hands Off," FPC Told as Natural-Gas Hearing Opens . . 36
Ernst Klappenbach, Journal Vice President, Is Dead 37
OPA Authorizes Temporary Price Rise on Some Products . . 40
Venezuelan President Sidesteps Oil Dispute 40
Peacetime Version of PIWC Viewed as Possibility 41
Labor Front Becoming Quieter as Unions Accept Increases . . 41
Four-Power Conference May Study European Oil Dispute 42
Water-Flooding Engineers Initiate Conferences on Techniques 44
Depletion Rights of Landowners Upheld 44
I.N.G.A. Told Powerful Interests Seek to Displace Natural Gas 48
Mexican Industry Seeks Gas 49

Editorial 35
This Week 39
Deaths 48
Natural-Gas News 99
Natural-Gasoline News . . . 99
Refining News 100
Pipe-Line News 102
Statistics and Trends 104

ENGINEERING AND OPERATING

High Recovery, Fractionation, Mark Lake Creek Operations . . 50
Future Oil Possibilities of New Mexico 52
Questions on Technology 62
United Solves Difficult Problems in Suspension Bridge 68
The Optimum Rate of Production—Part 23 72
Plant Practices 86
Engineering Fundamentals 89
The Refiner's Notebook 91
Oil and Gas Equipment Digest 95

EXPLORATION AND DRILLING

Weekly Well-Completion Record 104
Daily Average Production for Week 105
Oil Shows Rumored in South Dakota 107
Reports by Areas Start on Page 107

ADDITIONAL FEATURES

Market Summary 104
Drilling Contractors 118
Events on the Calendar . . . 119
Personals 120
Classified Advertising 123
Advertisers' Index 126

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Cure, Not Cause

WE are encouraged by the tenor of recent press and radio analyses of causes underlying the difficulties in northern Iran now before the UNO security council in an initial test of the strength of that organization designed to direct peacetime activities between nations.

Commentators are less inclined than they were a few weeks ago to dismiss the situation in the upper Iran area, which has precipitated an international crisis, with the brief observation, "It's oil." Some have taken the trouble to find out that there is no commercial oil in northern Iran, and that there are dry holes. Those familiar with conditions will agree that there are more likely oil areas in Iran than in the region surrounding the lower Caspian.

It is also true that the Iranian charges of Russian infiltration into the northern provinces, with all the accompanying accusations, go back many years. There were disputes and agreements between the two countries regarding these and allied matters in the days of the czars. Present Soviet activities are a revival of the past and have as their objective the protection of boundaries, a policy already effected in its western borders.

This gives us an opportunity to point out that there is not a single economic, social, racial, or religious problem in the Middle East, of which Iran is a part, which does not predate the discovery of oil. Yet many analysts, baffled by the current political reactions from these age-old conditions, seek an easy answer by pointing to the oil fields and refineries located at scattered points.

The truth is that this oil, which these observers insist on associating with all that is sinister in the muddled outlook of the Middle East and contiguous countries, is responsible for practically all of the economic progress achieved in that part of the world over the past quarter century. It has supplied governments with needed revenues, trained thousands of nationals in the petroleum and other industrial arts, and promoted general trade.

The need now is an improved standard of living. There can be no sustained peace without advances from the marginal existence of a large part of the world's population living in Asia and Africa and parts of Europe. Middle East oil lying at the crossroads of these vast regions can supply the power, light, and heat for a constructive program. Within the areas in which oil operations are under way a start has already been made.

The great international question so far as oil is concerned is whether or not there is sufficient intelligence and foresight in Allied statesmanship to realize that petroleum is a cure for most of the political problems confronting the Eastern Hemisphere, not their cause.

E. DEGOLYER

GEORGE A. HILL, JR.

R. C. KAY

This trio of witnesses were among those who presented testimony at the Houston hearing of the FPC investigation

"Keep Hands Off," FPC Told As Texas Gas Hearings Open

by Charles J. Deegan

HOUSTON. — The Federal Power Commission was warned to keep its hands off of the production of oil and gas in Texas as it opened its hearings here. In courteous, but plain language, the commission was told that the people of Texas will not tolerate interference by the federal agency in matters which Texas considers subject solely to her own state government regulation, not only from a legal standpoint, but also because they affect the prosperity and well being of the people of the state. The commission was further told that it was in no way as well qualified to regulate these matters as the state, and that it had already done substantial harm in some of its decisions, which in the opinion of Texans, went beyond the powers that Congress had intended to confer on the commission, even though the decisions had been upheld by the Supreme Court.

The barrage of testimony, covering not only the legal aspects, but also bringing out the various problems involved, both economic and technical, covered practically every phase of the gas situation, its relationship to oil, and the impossibility of segregating gas regulation from oil regulation.

Governor Coke Stevenson welcomed the commissioners to Texas, and at the same time warned them frankly that Texas would not submit to their control over production of oil or gas, whether that control was sought openly, or whether an attempt was made to gain such control indirectly with "conscious obscurity," aimed at hiding such a move until the purpose had been achieved.

Stating that the commission will be told Texas has more than 80 trillion cubic feet of gas, the governor declared: "It cannot be reasonably expected that we will quietly submit to federal control over producing, gathering, and processing of this valuable state resource. We believe that in this field the rights of Texas are paramount and that the federal Government should abstain from any exercise of power therein."

The governor said it was reasonably obvious that the chief interest of FPC pertained to investors in long gas-transportation lines and to gas consumers, most of whom reside in states where production of oil and gas is not a major industry. The interests of Texas on the other hand included many other phases of the gas business, including buying and selling oil and gas leases, drilling oil and gas wells, producing, processing, and marketing both oil and gas. Landowners, royalty owners, workers in the industry, tax collectors, and other officials of local county, city, and school bodies, state government revenues, as well as the local consumers of gas,

FPC Denied Funds for Expansion of Activities

WASHINGTON.—The Federal Power Commission is denied funds to expand its activities in the Independent Office appropriation bill as it passed the House last week. The bill went to the Senate carrying $3,116,000 for FPC, which the appropriations committee said was sufficient to permit it to function during the 1947 fiscal year on substantially the same basis as at present.

The budget bureau had recommended $3,707,000 for FPC for fiscal 1947. The sum allowed by the House, $591,000 below the Budget request, is $116,000 above funds available during the current fiscal year but most of this will be absorbed by the recently approved increase in federal employes' pay.

FPC officials asked funds for a much larger staff to meet anticipated peacetime duties, particularly regulating natural-gas rates and examining applications to construct natural-gas transmission lines. Present funds permit FPC a staff of about 610 persons compared with the 783 employed during the peacetime year 1940. FPC asked funds to employ about 900.

were all involved and affected in various ways, and their problems had to be considered. State laws and regulations now adequately and efficiently regulated these activities, and federal power should not be extended to them.

Recalling that when Texas joined the Union, it was guaranteed the right to retain all the vacant and unappropriated lands lying within its limits, the governor declared: "Any national legislation or regulation depriving the state of the discovery value or increased value of its lands because of the discovery of oil and gas, will be considered a violation of this guarantee." This was a reference to the commission's decision in the Canadian River case, in which it not only based its rate decision on the value of the transmission property, but insisted that the gas leases be included in the investment on the basis of their cost prior to the discovery and development of gas production, instead of their enhanced value resulting from the discovery of gas.

Congress Should Clarify Act

The Natural Gas Act, from which FPC derives its powers, should be clarified by Congress, so as to prevent specifically the commission from exerting any control of the production, gathering, or conservation of gas, according to Chairman Olin Culberson of the Texas Railroad Commission, in his testimony. Culberson vigorously defended the state's right philosophy, upholding the right and ability of the respective states to maintain control over their natural resources until they cross the state line in commerce.

Emphasizing that his position in this matter is the official position of the State of Texas, he demanded that the federal Government accept and support this concept. He said: "I am unalterably opposed to any basic plan or program to nationalize the oil and gas resources of the United States. I am authorized to state that this expresses the view, not only of the Railroad Commission of Texas, but also of the committee appointed by the governor of Texas to formulate a statement of principles reflecting state policy with reference to this matter."

Citing the inseparability of oil and gas in any regulatory policy, he said that "the only ultimate outcome of federal control over gas will be the complete domination of the oil and gas industry by the federal Government." Such a development, according to Culberson, would be contrary to the best interests of Texas and of the Nation.

On the question of exportation of Texas gas, Culberson reiterated his position: "I do not believe that our tremendous Texas gas resources should be squandered by being taken out of this state at a cheap and inadequate price in competition with

ERNST KLAPPENBACH—1892-1946

NEARLY half a lifetime of service with and for the Petroleum Publishing Co. was ended January 26 with the death of Ernst Klappenbach, 53, vice president. As advertising manager for The Oil and Gas Journal and Petroleo Interamericano, he had amassed a host of friends in all branches of the petroleum industry.

His service in the Journal's advertising department started in September 1922 at Chicago, where he was born. Previously he had been employed by other trade publications in Chicago and New York. He became advertising manager for the Journal and moved to Tulsa in 1929. He became vice president of the publishing company in 1938.

Death resulted from a heart ailment which first developed in 1940. The fatal attack started a week before his death but was not considered critical until January 25 when he entered a Tulsa hospital. Since his earlier illness was first asserted, Mr. Klappenbach had observed a rigid routine in living habits. Thus he retained much of the forceful vigor which characterized his earlier business life.

He had a prominent part in guiding progressive publishing practices, including establishment of Petroleo Interamericano in 1943 as a bilingual petroleum-trade publication for the Latin-American oil industry. His constructive thinking and sound judgment are also reflected in the modern Journal.

Funeral services were conducted in Tulsa, January 29.

Survivors include the widow; a son, Lt. E. S. Klappenbach, Jr., now on Navy duty at Jacksonville, Fla., after serving many months during the war aboard the Destroyer Smith; a daughter, Mrs. Joseph A. Tucker; a granddaughter, Joel Tucker; a brother, A. W. Kay, Evanston, Ill., and a sister, Mrs. C. W. Hunter, Flint Ridge, Calif.

coal and other fuels in those regions of our country which possess large coal or other reserves." But, he added, "The power of the state is ample, as the occasion arises; to control and regulate the production of gas so as to prevent physical and economic waste. Federal aid in this field is unnecessary and unwise."

Objecting strongly to "proposals for arbitrary and artificial regulation of gas use, . . . the so-called end use control theory," and declaring that there is "no special or critical use for which gas must be reserved," Col. Ernest O. Thompson, senior member of the Texas Railroad Commission, urged that natural gas be allowed to compete with coal in any market. Denying that so-called inferior uses of gas causes its economic waste, he noted that the latter term has "frequently been distorted and twisted, fostering misunderstanding to serve special ends." His position was that where production is controlled to prevent physical waste and secure maximum recoveries, then the most superior use of gas is that which commands the best price.

"Conservation and price go hand in hand," Thompson said. "An increased field price for gas would be the greatest conservation measure that could be adopted." He pointed out that gas has value only when it has a market, and that the owner then begins to conserve it. "Under the guise of regulating the interstate transportation of gas, the FPC should not exploit Texas' gas fields by restricting delivery price of gas to a point that yields only 6½ per cent on the prediscovery cost of the fields. Depressing the price in one field that is owned by the transporter has a disastrous statewide tendency because the pipe-line market determines the price of gas."

Thompson stated that the jurisdiction of federal agencies should be clearly and rigorously limited to the interstate transportation of gas and sale of gas in interstate commerce for resale. There should be no attempt by any federal agency either to reach forward or regulate the local sale or distribution of gas, or to reach backward and attempt to control either directly or indirectly, the production, processing, gathering, and compressing gas, or the price of gas prior to its sale for resale from the main transportation line of an interstate carrier.

While firmly supporting his senior colleagues on the Texas Railroad Commission on the question of how far the authority of FPC should extend into Texas affairs, Beauford Jester also urged the commission to recognize in their price-fixing policies that the current price of Texas gas at the well head is "far too low."

He warned the commission that it would probably be held responsible by the coal industry, in part at least, for the loss of markets to low-priced natural gas, stating "it might be observed, too, that any contribution made by the orders of the FPC, designed and intended to bring about the cheapest price for the consumers in areas with large coal reserves close by, should be held responsible for the rising complaint of the coal industry to displacement of that fuel by low cost, low-price natural gas." He stated that an artificially maintained low price for natural gas can be justly pointed to as a cause for the prevalent fear and disturbance in the coal industry.

Long an opponent of Texas natural gas exports, which he stated now amounts to about 15 per cent of the state's production, Jester restated his position, declaring "I have been opposed to the exportation of natural gas out of Texas because I felt that it is an economic crime to sell this valuable natural resource at such comparatively low prices."

Sellers Warns Against Dual Control

The history of the gradual growth and development of Texas gas-conservation laws was presented to FPC by Grover Sellers, attorney general of Texas, who warned that confusion will be the only result from any attempt to dual control of Texas gas production by federal and state agencies. In addition to oral testimony, he filed a 72-page printed brief, digesting the various legal steps, by which through trial and error and experience, Texas regulatory laws had been evolved and upheld by the courts.

Giving an ultraconservative estimate of the proved natural-gas reserves of Texas as in excess of 82 trillion cubic feet as of January 1, 1945, Dr. E. DeGolyer, internationally known geologist and engineer, told FPC that in his opinion "we are justified in considering the gas reserves of Texas to be of the magnitude of 125 to 150 trillion cubic feet" when certain variables and possibilities are properly evaluated.

He denounced control of end use as completely fallacious as a gas-conservation measure, citing as an example the use of natural gas for carbon-black manufacture because "it is the most economic method of producing that essential material." As long as approximately a billion to a billion and half cubic feet of gas is being flared daily in Texas, the attempt to conserve through restrictions against the so-called inferior uses, fails miserably as an attempt at conservation. No use of gas can be inferior to its burning in an oil-field flare."

Stating that there was no problem of end use or of conservation which would not be solved if the producer could have adequate markets and a decent price, DeGolyer stated that strictly as a private individual, he believed in and recommended a program of (1) ratable take in the individual gas field; (2) proration of markets between competitive fields, and (3) adequate well-head price for all marketed gas, with price the only regulator of end use.

He also told the commission that as a result of low well-head price, and inadequate drainage regulations, plus the application of the public-utility restricted earning rule, applied by the commission to gas-producing properties, the exploration and development phase of the natural-gas industry was in jeopardy. The production branch was characterized by the witness as the foundation upon which the natural gas industry is built, while the exploration is "the risk phase of the business."

Citing the financial gamble of the wildcatter, he opined, "Remove or so reduce the profit incentive, and the industry will become a liquidating one. The future of the natural-gas industry, as well as the petroleum industry, lies in continued wildcatting at an increasing rate. It is most important, therefore, that the finder and developer of natural-gas resources, as well as petroleum deposits, receive an adequate price for his product."

Speaking as an independent operator, S. Maston Nixon, vice president of Southern Minerals Corp., of Corpus Christi, told the commission that setting of gas prices for interstate companies, based on prediscovery costs, rather than current values of

(Continued on page 47)

Smith Says Action On Certificate Applications Will Not Be Deferred

HOUSTON.—Action on certificate applications will not be deferred by Federal Power Commission until after the current investigation on natural gas is completed, Commissioner Nelson Lee Smith announced here this week. There has apparently been some misunderstanding of statements made several weeks ago by Chairman Leland Olds of FPC before the Senate appropriations subcommittee, when he said, "Only those certificates are being authorized where an absolute need is shown."

Smith said it was obvious that the commission could not lawfully adopt a policy of standing still over a period of months by failing or refusing to perform its plain duty under the Natural Gas Act, waiting on conclusion of general investigation hearings. The two must go on side by side. Smith also warned against drawing general conclusions about the commission's over-all policies from decisions in specific cases based on specific factors and evidence.

THIS WEEK

NATURAL GAS—FPC urged to keep "hands off" by battery of witnesses at Houston hearing. . . . State laws and rules adequate. . . . FPC denies that certificates will be withheld until investigation is closed. . . . ¶Improvements claimed in Texas University's electrical discharge process for cracking natural gas. . . . Value of gas thus enhanced as basic material for industrial chemicals. . . . ¶Hope Natural Gas Co. and East Ohio Gas Co. propose 10-million-dollar expansion. . . . Program embraces 287 miles of line, compressors, other power facilities. . . . ¶El Paso Natural Gas Co., Southern California Gas Co., and Southern Counties Gas Co. will make formal application for 1,300-mile line February 13. . . . ¶Independent gas association embraces policy of equitable withdrawals to preserve correlative rights. . . . ¶Northern Natural Gas Co. authorized to build 50 miles of 20 and 24-in. line in Kansas.

SUPPLIES—Gasoline stocks push above 100-million-barrel mark for first time in recent years. . . . Fuel-oil inventories drop lower. . . . ¶Stock and current production of Ethyl fluid held adequate for normal requirements. . . . Proposed increase in minimum octane for premium fuel delayed. . . .

RUBBER—Rubber companies striving for "tire of the future." . . . Service of 100,000 miles visualized, using butyl tubes and large percentage of synthetic in carcass. . . . ¶RFC sets 20.25 cents per pound as natural-rubber price from British, Dutch, and French areas in Far East.

PRICES—Refinery motor-fuel market softening. . . . Weakness reflected in tank-wagon and service-station prices. . . . Unbalanced refinery production chief cause of slump. . . . OPA adjustment on fuel-oil ceilings came too late for substantial correction. . . . ¶Massachusetts and Mississippi consider higher gasoline taxes—both may curb diversion. . . . ¶Texas independents ask President Truman to intervene in adjusting disparity between crude-oil prices and general commodity index. . . . ¶OPA testing oil-industry sentiment on abolishment or retention of price control.

FOREIGN—Four-power conference in prospect exclusively devoted to petroleum affairs. . . . ¶State Department dissatisfied at slowness of negotiations with Soviet Russia on Hungarian fields formerly owned by Jersey Standard affiliate. . . . ¶Standard-Vacuum inspection mission denied ingress to Netherlands East Indian properties. . . . Strong protest lodged with U. S. State Department. . . . ¶President Betancourt of Venezuela makes no reference to validity of oil concessions. . . . Operators consider negative development as favorable. . . . ¶Imperial Oil to build catalytic-cracking and polymerization plants at Montreal East. . . . ¶Battle lines forming on Anglo-American oil agreement. . . . Industry's leaders and most associations favor it—some independents and politicians opposed. . . . ¶Important negotiations reported under way for sale of Middle East producing property. . . .

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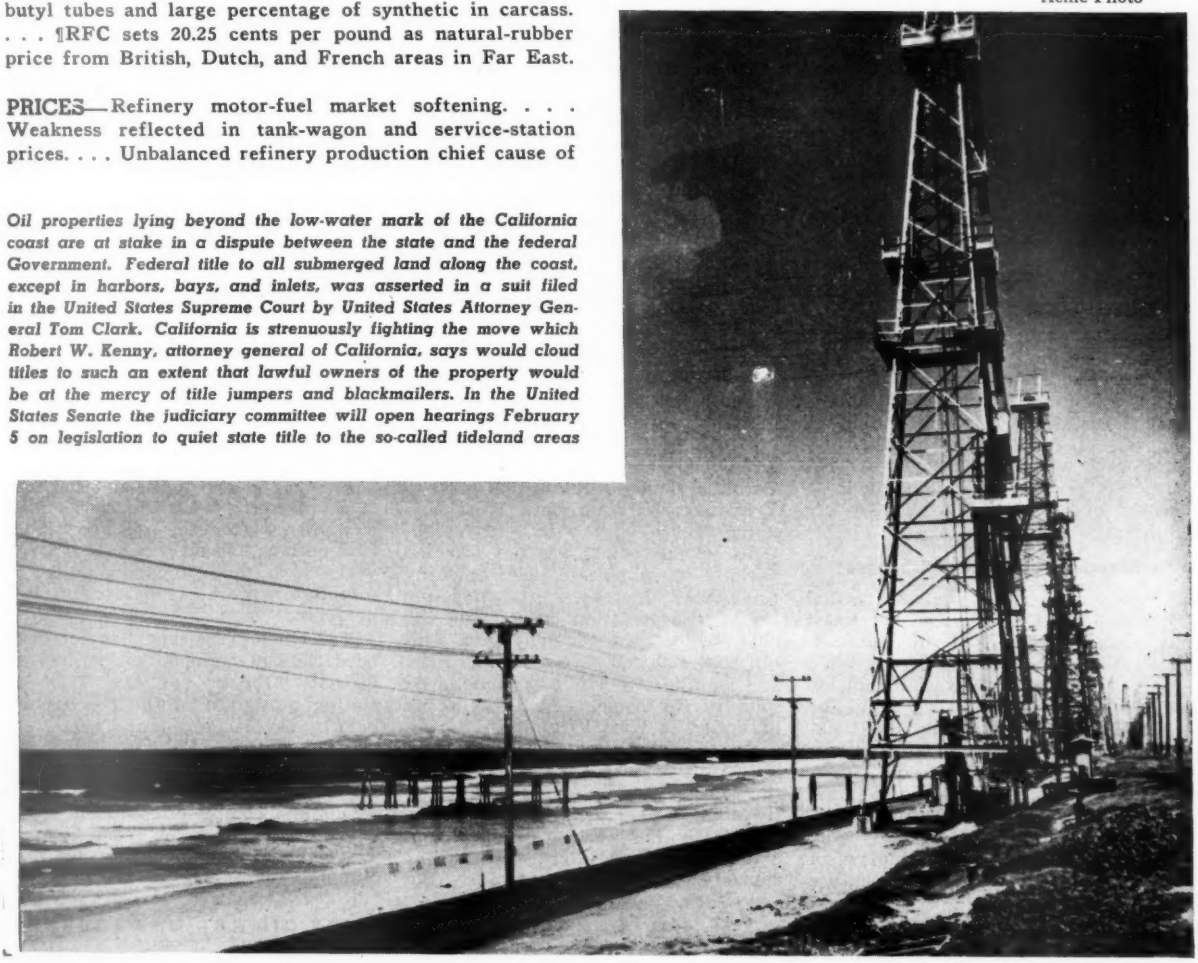


Oil properties lying beyond the low-water mark of the California coast are at stake in a dispute between the state and the federal Government. Federal title to all submerged land along the coast, except in harbors, bays, and inlets, was asserted in a suit filed in the United States Supreme Court by United States Attorney General Tom Clark. California is strenuously fighting the move which Robert W. Kenny, attorney general of California, says would cloud titles to such an extent that lawful owners of the property would be at the mercy of title jumpers and blackmailers. In the United States Senate the judiciary committee will open hearings February 5 on legislation to quiet state title to the so-called tideland areas

OPA Authorizes Temporary Price Rise on Certain Needed Products

by T. F. Smiley

FORESHADOWING a readjustment of ill-balanced refinery operations which have produced burdensome inventories of gasoline while intensifying an acuate shortage of kerosene and heating oils, Office of Price Administration on January 24 authorized a temporary upward revision in prices of the needed products in the Middle West, Gulf Coast, and East Coast areas. Taken in connection with OPA's order of December 19, this affords ceiling prices ½ cent a gallon higher than prevailed up to that date in Districts 1, 2, and 3. No changes are made in District 4 (Rocky Mountain) and District 5 (Pacific Coast). The new ceilings will remain effective through April 30.

The increases effective through April 30, authorized by OPA on December 19, included ½ cent per gallon on kerosene, range oil and No. 1 fuel oil, and 1/5 cent per gallon on Nos. 2, 3 and 4 fuel oils. These increases were applicable at all levels of distribution in District 1, except on sales for export or sales to exporters, and excepting also sales to or within Area D, which comprises most of West Virginia and the western parts of Pennsylvania and New York. The increases applied also to sales by refiners and tanker terminals on the Gulf Coast, but only for shipment to ultimate destinations in District 1.

The increases did not apply to shipments for export, sales to exporters, or to shipments in Area D of District 1. Because Area D in District 1 is itself a refinery area, with no apparent shortages of kerosene and burning oils, OPA stated that it felt it desirable to widen the margin for distributors on any sales they made to nearby points outside Area D, where a shortage might exist.

Standard of Indiana Changes

Following OPA's latest action Standard Oil Co. (Indiana) increased its prices January 28 on kerosene, heater oil, furnace oil, other distillate fuels, and diesel fuels, but not on residual or heavy fuels, ½ cent. The changes apply to tank-car and tank-wagon levels in Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Oklahoma, Nebraska, North Dakota, and South Dakota. They are designed, the company said, "to stimulate refinery production of certain petroleum products which are in short supply." Refiners in the Southwest and Gulf Coast regions were adopting the higher prices.

Statistics on stocks and trends, which are important factors in the rise and fall of prices for refinery products, will be found on pages 104 and 105.

Gasoline prices, which during the war often pushed hard against government-fixed ceilings, began to crumble several weeks ago as surplus accumulations looked futilely for places to go. Refiners reduced wholesale prices in the Middle West and East Coast areas, and some small independents are said to have been getting rid of swollen stocks at ½ to ¾ of a cent below ruling quotations. The higher prices now permitted by OPA for heating oils are expected to prompt rearrangement of plant operations, resulting in yields and inventories designed to aid in correcting the existing abnormal situation.

Tank-Wagon Quotations Lower

After cutting its tank-car price for gasoline ⅛ cent, Indiana Standard on January 14 lowered its tank-wagon quotations 0.3 cent throughout the 11 states in which it establishes the market. Group 3 (Oklahoma) refiners made a similar reduction in their tank-car prices, but none in tank-wagon.

Reductions in wholesale prices of gasoline ranging up to 1¼ cents were put into effect January 23 by Standard Oil Co. of New Jersey in North Carolina, South Carolina, and parts of Tennessee, Virginia, and West Virginia. These vary with local conditions. Some points are not affected because of subnormal prices already established. Increased efficiency and lower transportation costs made the cuts possible, the company said, adding that reduced prices for kerosene and heating oils would be announced soon in the same regions, with the exception of West Virginia.

For the third time in gasoline-market history stocks have soared above the 1,000,000-bbl. mark, and they threaten to pass the all-time high of 107,229,000 bbl. Many refiners who a few months ago were operating at capacity to meet demands of the armed forces are now in a quandary over what to do with excess motor-fuel output. The H. F. Wilcox Oil & Gas Co. plant at Bristow, Okla., has been closed because, according to the management, all its storage facilities are in use.

The situation on the Gulf Coast is described as less serious than in inland territory, partly because export business affords a measure of relief. On the Atlantic Seaboard, notwithstanding that gasoline-market conditions are relatively comfortable, some observers say Standard of New Jersey's new quotations might conceivably touch off a price war.

Natural Gasoline a Sufferer

Natural gasoline, whose fortunes are tied up with those of gasoline, is suffering from much the same "sloppy" market that afflicts its fellow product, and prices have dropped sharply in both the Oklahoma and North Texas areas. Refiners are not buying natural in the same volume as formerly. "Why store volatility?" they ask. Not only does handling tend to rob gasoline of this quality, but the finished motor fuel might not get out of storage until summer, when the importance of volatility declines.

Export business of natural-gasoline manufacturers is not affected so much as domestic, since a substantial part of the material goes to warm climates. Manufacturers said this week that if general conditions did not improve soon, they, like refiners, would have to begin storing their product.

Venezuela's President Sidesteps Oil Dispute

NEW YORK.—Spokesmen here for oil companies operating in Venezuela expressed satisfaction early this week over the report that Venezuela's revolutionary president, Romulo Betancourt, did not attack the validity of oil concessions held there by American and British interests. Validity of the concessions had been questioned January 10 by Romero Sanchez, former senator.

The oil concessions in question, some of which were of an uncertain character before the passage of the 1943 oil law, had been extended for 40 years with the companies paying a minimum statutory royalty of 16⅔ per cent.

Nevertheless, former Senator Sanchez filed a denunciation with Venezuela's Ministry of the Treasury stating that most of the concessions, held by Creole Petroleum Corp., Venezuelan Oil Concessions, Ltd., and Mene Grande Oil Co. in the western Lake Maracaibo region were illegal. He claimed complete restitution of the value of the oil taken from them in the neighborhood of 105 to 200 million dollars.

Peacetime Version of PIWC Viewed As Possibility—Poll Nears End

NEW YORK. — With practically all answers in from former Petroleum Industry War Council members on their reaction to the peacetime organization of some advisory group, similar in scope, indications are stronger than ever that definite action on this issue will be taken in the near future.

This past week six more replies were received by W. Alton Jones, president of Cities Service Co. and chairman of the committee sounding out the views of former members on a program "designed to preserve the cooperative spirit of intraindustry unity perfected in the war effort." Of the six additional replies, 50 per cent were favorable, according to a spokesman for Jones. Last week, Jones' office reported that about 65 per cent of the members had sent in their answers and the majority of them also was said to be favorable.

However, chances are that the peace time organization won't be set up immediately, although there is one school of thought — centering in the Midwest—which believes that too much time should not elapse between the defunct PIWC (which ceased to exist December 31, 1945) and the rebirth of the new oil organization, which presumably will carry the name of National Petroleum Council.

But there is another school of thought — and indications are that there are more backers for this second approach—which holds that the Government should ask the industry to form an advisory group, rather than the industry forming a group itself and in effect say: "Here we are, Uncle Sam. What can we do for you?" or "Here we are Uncle Sam. Here's what we can do for you."

"Weightier" Body

Those who believe in the invitational approach hold that PIWC wouldn't have accomplished one fraction of what it did had it not been for the fact that the Government (Petroleum Administration for War Harold L. Ickes) asked the industry to organize along compact advisory-body lines. And similarly, it is held, the peacetime counterpart of PIWC will be a much "weightier body" if the Government seeks industry advice (and all indications are that this will be done) than if the industry organizes and offers its services independently.

Moreover, some circles believe that the Government will hold off making such a request until the much talked-about joint Army-Navy-Interior super oil-control board comes into being, and according to grapevine reports here the industry won't receive any request until:

1. Secretary of Interior Ickes is out of the cabinet, and one report is that this will be shortly after publication of another of his books hits the public.

2. Under Secretary of the Navy Edwin W. Pauley becomes secretary, which may be in about 3 months when Navy Secretary Forrestal leaves.

But even if Ickes doesn't retire, it is doubtful whether he would issue the oil industry another invitation, on his own authority; but it is entirely possible that he would be party to a joint invitation by government agencies other than the Department of Interior.

Oil men in circles which believe in the government - help - by - invitation approach hold that if the petroleum industry did formulate an advisory board chances are the Government would say that the organizational lines of such a body was not exactly what was wanted. "It is better to be invited to a party than to crash it," was the terse comment of one source.

As for men who might be selected to head PIWC's peacetime counterpart, the list ranges from "big names" like ex-president Herbert Hoover, through Jim Farley, an East Coast college president, and finally down to big names with oil industry connections such as Lieut. Gen. James Doolittle (Shell Oil Co., Inc.)

Whatever the time factor may be in the formation of such an industry group, there is not much doubt, by oil men and government oil officials alike, but what the spirit engendered by the Government and PIWC will survive under some form of a post-war organization.

Labor Front Becoming Quieter As Unions Accept Increases

WHILE the steel strike and government seizure of the meat-packing plants continued to hold the center of national attention, the week brought these scattered labor developments directly affecting the petroleum industry:

1. In Houston, Shell Oil Co., Inc., reached an agreement with the Oil Workers International Union covering 1,900 employes of the Deer Park refinery. Following the usual pattern of settlements, an 18 per cent wage increase was provided. The Navy, which had brought union and management representatives together in conferences sponsored by its labor "task force," returned the plant to the company.

2. The task force, successful in settling the Shell dispute, sought to effect an agreement between The Texas Co. and the C. I. O. union. With no agreement after a week of conferences in Houston, the Navy flew a group of union officials and company executives to Washington for conferences with Vice Adm. Ben Morrell, who has been operating the 53 refineries seized by the Government last October.

3. In Linden, N. J., the Cities Service Oil Co. refinery was returned to private management by the Navy. The company settled with the union on the 18 per cent, 40 - hour - week formula.

4. Union workers at Augusta, Kans., accepted the offer of Socony-Vacuum Oil Co., Inc., of the 18 per cent increase in the company's refinery. The increase takes effect when the 40-hour week is resumed. The agreement includes a company - security clause under which the company will be given 30 days' notice before the union attempts any work disruption. In offering to meet the fact-finding board's recommendations, B. B. Jennings, Socony-Vacuum president, addressed a letter to L. B. Schwellenbach, secretary of labor, declaring that the board's determination of a fair wage on the basis of ability to pay is a threat to free enterprise. Negotiations are continuing at three other Socony-Vacuum refineries.

5. In Houston, production at Hughes Tool Co. was sharply cut as a result of the steelworkers' walkout. The company is a major manufacturer of oil-field equipment. Five men were arrested in Houston after two non-strikers claimed they were beaten.

6. The International Union of Operating Engineers, A. F. of L., was certified as bargaining agent for operating and maintenance employes in the gasoline division of Phillips Petroleum Co.'s Oklahoma City area. The National Labor Relations Board announced employes voted 93 to 46 for the union in preference to an independent group.

Four-Power Conference May Study European Oil Disputes

NEW YORK.—Within the very near future a four-power conference is expected to be held—probably somewhere in Europe—to determine what constitute's Nazi-owned assets and the identification of these assets which were acquired as a result of forced transfers of oil, and other, lands and properties.

The need for such a conference was further evidenced here late last week by the following two developments:

1. The arrest, in Germany, of six prominent German oil men who were assertedly involved in the seizure and exploitation of oil properties in occupied countries; and

2. The continued difficulty being encountered by American and British oil interests with Russians in Austria where the Soviets have—diplomatically so far—declined to recognize the fact that the bulk of certain producing properties which, according to Austrian law, are in German hands, actually do not belong to them.

The oil leases in question "legally" are in certain German hands only because of the fact that the Nazis, on occupying Austria, altered that country's petroleum laws to suit their own purposes. In fact, the "legal alteration" was carried so far as even to force the original owners to accept a certain amount of money for the properties.

However, Austria, as well as her Allies, are not only aware of this common Nazi land-grabbing practice but is a signatory of the "Declaration Regarding Forced Transfers of Property in Enemy Controlled Territory," which is dated July 5, 1943. This declaration, in part, reads:

Those signing this declaration "hereby issue a formal warning to all concerned and in particular to persons in neutral countries, that they intend to do their utmost to defeat the methods of dispossession practiced by the governments with which they are at war against the countries and peoples who have been so wantonly assaulted and despoiled.

"Accordingly, the governments making this declaration and the French National Committee reserve all their rights to declare invalid any transfers of, or dealings with, property, rights, and interests of any description whatsoever which are, or have been, situated in the territories which have come under the occupation or control, direct or indirect, of the governments with which they are at war or which belong or have belonged to persons, including juridicial persons, residents in such territories."

The declaration pointed states:

"This warning applies whether such transfers or dealings have taken the form of open looting or plunder, or of transactions apparently legal in form, even when they purport to be voluntarily effected."

But this is not the only article of its type to which Russia is a signatory, for in October 1943, at the Tripartite Conference in Moscow, the Soviet Union further agreed that "they regard the annexation imposed on Austria by Germany on March 15, 1938, as null and void. They declare that they wish to see reestablished a free and independent Austria, and thereby to open the way for the Austrian people themselves as well as those neighboring states which will be faced with similar problems, to find that political and economic security which is the only basis to lasting peace."

Russian Possessions

But, despite these agreements, presumably signed in good faith, certain Russian oil circles presumably assume that the Potsdam agreements—granting Russia as reparations certain German holdings—supersedes the aforementioned signed agreements. Actually, there is nothing in the Potsdam declaration to justify this belief, well-informed sources here report. But as present circumstances shape up, Russia possesses over 95 per cent of all the valuable oil areas in Austria, including the United States and British holdings expropriated by the Germans under the "Bitumen Law," which was drawn up after the Anschluss.

Indicative of the fact that at least some Russian sources feel a possible pang of conscience is the fact that feelers have been put out, by representatives of the German-owned properties, to "sell" the disputed properties to the United States and British interests which are merely trying to regain property which rightfully belongs to them. An ironical smile is about all that oil men here have to say about this "generous offer," which must have been made, it is pointed out, with the knowledge of Russians in charge of Austria.

As for the money which the United States and British interests were forced to accept, all indications are that these companies probably would be willing to return the money—an infinitesimal amount compared with the value of the oil properties—only the question arises: return it to whom? This is a question which probably will have to be decided, as possibly the entire matter of the expropriated oil lands will be, by the State Department.

While it is known that the Soviets, in some cases, have insisted on following out to the letter, signed agreements, there is some feeling in oil circles here that Russia's postwar foreign policy, in so far as oil is concerned any way, is primarily based on what is expedient, while the United States foreign policy, regarding oil any way, remains somewhat of an enigma. United States and British oil interests are looking forward with considerable expectation to the forthcoming four-powered conference, which it is hoped will spell out, in A, B, C terms exactly what constitutes bona fide German assets.

Indicative of the fact that the Germans made a shrewd move in "legally" acquiring large Austrian leases, are the production figures which show that total production in that country for 1939 was only 1,015,000 bbl. while in 1944 it had jumped to 8,491,000 bbl. But after Austria commenced to feel the effects of Allied warfare, the reported rate of production fell to approximately 5,250,000 bbl. a year. Austrian production is largely of paraffinic and mixed-based crudes.

Names of the six German oil men who have been taken into British custody, and their company connections follow:

Hans Brochhaus, director of Kontinentaloel, A.G., and other companies; Max Engel, managing director of Deutsche-Vacuum Oil, A.G.; Edmund Gellenberg, director of the Stahlwerke Braunsweig of the Herman Goering Werke Complex; Carl Grosse, deputy chairman of Deutsche Petroleum, A.G., and director of Deutsche Erdoel, A.G.; Hans Hubrig, former director of Etusche Erdoel, A.G.; Dr. Emile Helfferich, former chairman of the Deutsche-Americanische Petroleum Gesellschaft.

Bourne Elected President Of Tulsa Nomads Chapter

Henry Bourne, sales manager, Republic Steel Corp., has been elected president of the Tulsa chapter of Nomads. Other officers are Russell Hunt, attorney, vice president; Mitchell Tucker, manager of market research, The Oil and Gas Journal and Petroleo Interamericano, secretary; Earle E. Smith, sales manager, National Tube Co., assistant secretary; M. D. Gilbert, district manager, Pittsburgh Equitable Meter Co., treasurer; K. O. Hoevel, district sales manager, National Supply Co., assistant treasurer; J. H. Eustice, president, W. C. Norris Manufacturer, Inc., sergeant-at-arms; and Shep Miers, manager of Southwest Supply Co., and W. G. Green, president of Engineering Laboratories, Inc., regents.

Ickes Urges Federal Development Of Continental Shelf Possibilities

WASHINGTON.—The nation's mineral resources have been so depleted by the war that strenuous efforts should be made for conservation, exploration, and development of new processes for marginal production—this is the theme which runs through the annual report of Secretary of the Interior Harold L. Ickes.

Few specific references to oil and gas are found in the report beyond recitations of routine work of the various bureaus during the past year, proposals for closer control of the public lands, and defense of the long-range Bureau of Mines program for development of synthetic-fuel processes.

In discussing the Bureau of Mines, Ickes suggests a program of inventorying the nation's mineral resources, further technical research on mineral recovery and processing, and more statistical and economic studies. He also asks for "positive" legislation for minerals conservation, but gives no details of this proposal. On this point his report says:

"Without a detailed knowledge of the economic conditions in the minerals industries, no program of exploration and investigations could be expected to succeed. I think that the Bureau of Mines should be authorized to expand its economic and statistical services to obtain accurate and up-to-date information on the production, distribution, and consumption of all of our minerals and fuels.

"The mineral legislation under which the Bureau of Mines operates now, with one or two exceptions, is permissive in nature. The bureau in general is an advisory agency, and is in no position to exercise any authority over the use of mineral resources. New legislation designed to cope with postwar problems should be more positive, requiring specific things to be done, and having the effect of defining a national mineral policy. A good example of the type of legislation needed is the Synthetic Liquid Fuel Act, which sets forth a specific 5-year program of research in the production of gasoline and oil from coal and oil shales, defines clearly what should be accomplished, and appropriates funds for the purpose. Another is the Federal Coal Mine Inspection Act, authorizing the inspection of coal mines in the interest of safety and efficiency.

"With its pilot plants and laboratories, its engineers, chemists, metallurgists, geophysicists, and other trained personnel, the Bureau of Mines is ready to put into effect a nation-wide program of mineral conservation and development which it believes will be in the interest of future security and national welfare. Many of its recommendations have been submitted to Congress, others are in advanced stages of development."

Specific Legislation Requested

Specific legislation to revise and codify the public land and leasing laws is requested in the report of Fred W. Johnson, commissioner of the General Land Office, including reservation of mineral rights on all lands acquired by any agency of the federal Government. In this connection the report says:

"1. Rejuvenation of our federal mining laws is essential. Mechanized warfare has demonstrated that minerals are indispensable in modern war; under present statutes, no method exists for securing to the United States the utmost advantages from the development of such resources on lands under its control. No real mining conservation, a vital factor in the postwar economy, can be brought about without federal law granting authority for the United States to supervise the minerals which it owns. Except for statutes governing the development of the fuel and fertilizer minerals in public lands, no such authority exists at present. A general leasing system applicable to all minerals would provide the Government with not only the power to conserve but the opportunity to catalog and classify its natural assets to insure their maximum beneficial use during the reconversion period.

"2. Legislation is needed to extend the salutary provisions of the present mineral leasing law to lands acquired by the Government, as well as to the original public domain. Specifically, lands acquired by federal agencies under the National Industrial Recovery Act, the Bankhead-Jones Farm Tenant Act and various relief appropriations and rehabilitation acts, together with the public lands, constitute a veritable storehouse of essential minerals. Without the enactment of new laws, the United States may not catalog and in cooperation with private initiative develop the resources on these acquired lands through leases based on sound principles of conservation.

"3. Another element essential to the successful administration of the public domain, both in relation to mineral resource development and the general management of the federal estate along conservation lines during the postwar period, is complete, authentic information as to the character and status of the land. At the present time, evidence of the filing of thousands of unpatented mining claims is not made a matter of federal record, but is solely registered in county recording offices. The enactment of legislation to enable the recording of such evidence in the General Land Office is urgently recommended."

Samuel Tait Writes Colorful Oil History

To old-timers in the oil business as well as the younger group who are interested in the industry's colorful history, a new book from the Princeton University Press will prove valuable reading.

The author is Samuel W. Tait, Jr., a second-generation oil man whose father grew up in the excitement of the early-day Pennsylvania fields. The younger Tait built playhouses with stacks of "The Derrick's Annual on Petroleum" before he could read, and now, at the age of 47, is a successful Texas land man. His book is entitled "The Wildcatters."

Tait's book stems from a number of years of study as well as his own background. Its readers are taken on the search for oil in the United States from the time in the early 19th century when "rock oil" was an unwanted nuisance in West Virginia salt wells down through the opening of the more famous pools a few decades ago.

Geology gets its credit where it is due, but author looks with tolerance on such prospectors as his father whom he feels sure "never spent a dime of his money on a book by a rockhound." In a chapter on early petroleum geology and doodlebugs, he tells of such oil-finding devices as the forked hazel twig and of the unscientific views of a revivalist who asked the legislators of one oil state to prohibit drilling because the oil was intended to light the fires of Hell.

"The Wildcatters" follows the migrations of oil men from Oil Creek and Pithole, to Ohio and Indiana, into the Mid-Continent and Gulf Coast and on into the fields of the Rocky Mountains and California. Included also are chapters on oil towns, the history of drilling technique and an epilogue on the opening of the West Edmond field by Ace Gutowsky "with neither geologist nor a geophysicist." The numerous illustrations are scenes of the early fields, boom towns and drilling.

Water-Flooding Engineers Initiate Conferences on Technical Problems

by Kenneth B. Barnes

FIRST of a periodic series of meetings to discuss engineering problems in water flooding practice were started when approximately 65 engineers and producers gathered for an evening session, January 24, at Chanute, Kans.

The conference was directed by Marion Stekoll, Independence, Kans., operator. Representatives attended from the Garnett, Chanute, McCune, Independence and Eureka, Kans., areas and from the Nowata, Bartlesville and Tulsa districts in Oklahoma. The subject of channeling, bypassing and breakthroughs was taken up informally in the after-dinner discussion.

Problems of premature appearance of water in flood properties ranging from 280 to 2,200 ft. were brought up. Many of the water breakthrough troubles, it appeared, were due to the injected water channeling through lignite or coaly seams lying immediately below or above the productive formation, which was generally the Bartlesville sand. Several operators reported that casing the input wells slightly below the top of the sand and stopping the final exposure short of the base of the formation safeguarded against such action. They reported that the former practice of drilling a permanent pocket 5 to 10 ft. below the sand had been modified and that their input wells were now completed by dumping sufficient cement to fill back a short distance above the base of the sand.

There seemed to be considerable variation in the different areas as to the pressures at which breakthroughs could be obtained by the lifting of overburden, the amount varying from 1.0 to about 1.6 psi. applied pressure per foot of depth. Several operators reported that water breakthroughs apparently occasioned by excessive pressures would stop if the injection pressures were diminished as soon as the condition occurred, or before extended water circulation took place.

W. A. Heath, water flood engineer, Phillips Petroleum Co., Bartlesville, classified the general subject as being caused by one or more of the factors of differential permeability, differential saturation, and conditions of fissures and cracks of various types, and pointed out the importance of ascertaining those which might be present. R. C. Earlougher, of Earlougher Engineering, Tulsa, cited experimental tests of squeeze cementing at shallow depths such as 10 ft. to illustrate that the bonding properties of the formation itself might have considerable bearing on the parting conditions of the formation under high-injection pressures.

D. B. Taliaferro, petroleum engineer with the U.S. Bureau of Mines, Bartlesville, stated that the petroleum-experiment station there was assembling new equipment to determine pressure-rate conditions in field tests of water-injection wells when breakthroughs by overburden lifting or excessive pressure applications occurred. He stated the bureau would like to cooperate with flood operators in making field tests of their input wells.

At the next meeting of the group, to which all interested parties are invited, discussions will concern treatment of channeling and bypassing by such remedies as selective shooting, packer installations, selective plugging, etc., and is scheduled for 7:30 p.m., February 27, at the Booth Hotel in Independence. Inquiries about the projected program should be directed to Stekoll or Taliaferro.

Depletion Right of Landowner Upheld

WASHINGTON.—An oil-land owner who makes a usual type of lease in which his compensation includes a share in the net profits realized from operations under the lease is entitled to the depletion allowance of 27½ per cent under the federal income tax laws, the Supreme Court decided January 28 in two similar cases involving Kirby Petroleum Co. in Texas and Anna Vickers Crawford in California.

In the Kirby case the Fifth Circuit Court upheld the contention of the Commissioner of Internal Revenue that the depletion allowance is not deductible, while in the Crawford case the Ninth Circuit Court approved the allowance. In both cases the land owners leased for oil production in consideration of a cash bonus, royalties, and a share of the net profits of the operation.

The Supreme Court held that only a taxpayer with an economic interest in the oil is entitled to the depletion allowance and under his development contract he must look to the oil in place as the source of the return of his capital investment, adding that technical title to the oil in place is not important as the test of the right to depletion is whether the taxpayer has a capital investment in the oil in place which is necessarily reduced as the oil is extracted.

In both cases, the court said, the lessors had an economic interest in the oil used to pay royalties and bonuses whether paid in oil or cash proceeds from sale of this oil. If the additional payment had been a portion of the gross receipts from sale of oil from the lease there would have been no doubt that they were entitled to the depletion allowance, and their economic interest is no less when their right is to share a net profit.

$10,000,000 in Improvements Proposed by Two Companies

WASHINGTON. — Faced with an unprecedented domestic demand for natural gas, two companies, Hope Natural Gas Co. and East Ohio Gas Co., are asking the Federal Power Commission for permission to spend nearly $10,000,000 in extensions and improvements to pipe-line systems.

Hope's application proposing construction totaling $5,237,500 said the record heavy consumption and the prospect of continuing increases makes it necessary to connect its system to supplies from gas wells in Wyoming County, West Virginia, where, it added, considerable reserves have been discovered. In addition, the company is negotiating with Tennessee Gas & Transmission Co. for an additional 25,000,000 cu. ft. daily from facilities Tennessee is seeking to acquire and operate in another application now pending.

Hope, which sells gas at retail in West Virginia and at wholesale to several distributing companies in Ohio, Pennsylvania, and New York, proposes to construct 143 miles of pipe line, three compressors, a dehydration plant and other installations. One 55-mile, 12¾-in. line extending from the Jackson compressor station to Baileyville Magisterial district, Wyoming County, will bring the Wyoming County reserves into the company's systems. Three others are loop lines designed to increase the total capacity of Hope's system.

The East Ohio company pointed out its present delivery system has a capacity of about 355,000,000 cu. ft. daily, as contrasted to an estimated maximum demand this winter of 435,000,000 cu. ft. It asks the commission to approve a 95-mile line from Hope's terminal at Pipe Creek on the Ohio River to Austintown Junction, Mahoning County, Ohio, and a 49-mile line on to Maple Heights, a Cleveland suburb.

"Keep Hands Off," FPC Told at Hearing

(Continued from page 38)

their producing properties might establish an area price which would eliminate independent producers with higher production costs, and result in practical, if not legal, confiscation.

Explaining the practical effect of the tendency of the commission's efforts to reach back to local production of gas, he stated: "As an oil producer, I am afraid that the present policy of the commission toward fixing price for gas moving in interstate commerce will ultimately lead to federal regulation and control of oil-producing operations.

"Casinghead gas is produced with oil. I, and many others like me, am afraid that if we separate such gas, strip it of its liquid hydrocarbons, compress it, and deliver it to the main transmission lines, we are in danger of being regarded as performing an act in interstate commerce, and subjecting our oil-producing operations to the withering hand of federal control."

He explained that if a natural-gas company desired to purchase such stripped casinghead gas, it must first obtain a certificate of necessity and convenience from FPC before it can lay a line from its trunk line to the plant producing the residue gas. In order to obtain the certificate, the gas company must certify that the gas obtainable is necessary in order to assure an adequate supply of gas for the trunk line. Ordinarily the gas company cannot make such a certificate, because gas may be available elsewhere.

Vigorously attacking the proposals of FPC to control the uses to which natural gas is put, George A. Hill, Jr., president of Houston Oil Co. of Texas, and prominent independent, condemned the commission's efforts to exercise this control as a definite step in what he termed the "long and persistent campaign of government bureaus to substitute federal control for that of the states in the administration of energy resources."

He charged that the commission "bases its contention on the premise that the individual states and private industry are incapable of mature judgment in the administration of natural resources and delegates to itself the authority to determine what is wise use of them."

Texas reaps a harvest of over 16 million dollars yearly from the operations of her interstate natural-gas industry, without depleting or endangering the state's natural gas reserves, according to testimony of N. C. McGowen, of Shreveport, president of United Gas Pipe Line Co. Tracing the history of Texas as a gas consuming state, he showed that although it is now the largest oil and gas-producing state, during the past 39 years, it has imported substantial quantities of gas from other states, and still imports 50 billion cubic feet annually. From 1921 to 1931, Texas imported more natural gas than was piped outside the state.

He pointed out that in the Texas Panhandle in 1927 when the first interstate pipe line went into operation, of a production of 505 billion cubic feet, 485 billion cubic feet was blown into the air and lost, 9 billion taken by pipe lines, and 11 billion used in the field. By contrast in 1944, production was 825 billion cubic feet, of which only 4 billion were vented into the air, 95 billion used in the field, 262 billion used by carbon-black plants, and the pipe lines took out 464 billion, or 50 times more pipeline gas than 17 years previously.

"It is significant to note," McGowen said, "that Texas' gas reserves are estimated at 82 trillion cubic feet today, whereas on January 1, 1931, the entire United States reserve was estimated at only 46 trillion." He told the commission that the American people demand a free choice of everything they use, and will not like being told they cannot use natural gas because they live in a coal-producing area.

Hulcy Utters Warning

After discussing the early history of the development of gas-transmission lines and the problems met and solved resulting from rapid depletion of the initial supply sources, D. A. Hulcy, president of Lone Star Gas Corp., of Dallas, emphasized that too much regulation in that period of rapidly changing problems, might well have resulted in the industry's being the victim of infant mortality.

Turning to the technical aspects of the business of gas transmission and distribution from a competitive position, Hulcy pointed out that gas was the one commodity in which today's production must be either consumed, returned to the reservoir, or wasted, and that the capital investment must be based on the peak-demand period, even if that peak period lasted only a few hours.

While from the standpoint of elimination of waste, current disposition of casinghead or residue gas was a very important problem, it presented great utilization difficulties to gas pipe-line companies, since the reserve and delivery characteristics make it undependable as a primary source of supply to a natural-gas pipe-line company. He said that gas pipe-line companies should make every reasonable effort to take all the casinghead gas available, if procurable under conditions which permit them to reasonably utilize it.

Offering testimony on behalf of more than 150,000 Texas land and royalty owners, R. C. Kay, president of the Panhandle Producers and Royalty Owners Association, opposed any federal control of gas production, gathering, or processing within the state. He said, "If we land owners grant an oil and gas lease on our land, providing for royalty on the basis of a one-eighth portion of the proceeds, we do not want any federal agency to convert that purely private and local business transaction into a public utility."

Kay said further that the land owners in Texas want conservation regulation left in the hands of the Railroad Commission, an elective body of Texans, accountable to the citizens of Texas at election time, when the voters can exercise a check on the manner in which the regulatory body has performed its duties. They believed this would result in more efficient consideration of their interests than would be done by any federal agency.

Dr. L. A. Woods, state superintendent of public instruction for Texas, told the commission that "education in Texas is inextricably entwined in the state's oil and gas economy," and according to his data, the University of Texas alone obtains a yearly income of nearly 12 million dollars from its gas and oil lands, with the value of its proven producing properties estimated in excess of 200 million dollars. Other colleges and universities in the state have over 23 million dollars in endowment funds invested in gas and oil properties. The public schools of Texas, during 1944, had an income of over 27 million dollars from oil and gas sources.

He told the commission that "the functioning of our schools is so geared to the production of oil and gas that any threat to this income, such as the federalization of the oil and gas industry, or any further encroachment of the state's authority to regulate the industry, or any manipulation of gas rates by a federal agency that has the effect of destroying the value of

Index Ready Soon

The complete editorial index of The Oil and Gas Journal for 1945 is now in preparation, and will soon be ready. Due to the continued shortage of paper, it will not be published in a regular issue. The complete index, enlarged and improved and with more cross-references, bound separately, will be sent without charge to all subscribers requesting a copy. Address requests to Circulation Department, P. O. Box 1260, Tulsa.

gas, gas reserves and gas-producing lands, is alarming in the extreme to me as the head of the state's school system. My alarm is shared by many educators throughout Texas and the other oil-and-gas-producing states."

Restricting the export of Texas natural gas will not force new industries to move into the state, according to two qualified technical witnesses, George Fancher, professor of petroleum engineering, University of Texas, and Harold Vance, head of the petroleum engineering department, Texas A. & M. College, in testimony before FPC.

Bringing down to earth some of the glittering generalities, and showing the relative unimportance of some of the uses of natural gas which have been mentioned as superior in end use, these two engineers said it was improbable that "the use of natural gas for synthetic chemicals will increase sufficiently to require great amounts of gas." They noted that the entire yearly prewar production of plastics could have been made from the amount of natural gas popped and flared in Texas in 4 days. The entire yearly demand for methanol (synthetic wood alcohol, and widely used as an antifreeze in cars, as well as general industrial purposes) could be supplied from a single gas well, producing 10 million cubic feet daily.

The use of natural gas for fuel will continue to be the chief use, despite the fact that valuable products can and will continue to be made in increasing quantity from natural gas. However, insofar as attracting industry, or forcing it to come to Texas, they pointed out that to the average manufacturer, cost of fuel is only about 5 per cent of his total manufacturing cost. A dependable source of industrial raw material, and a market for the manufactured product, as well as cheap and assured fuel supplies are required to induce establishment of manufacturing enterprises.

I.N.G.A. Told Powerful Factors Seek To Displace Natural Gas

HOUSTON.—"Tremendous and all-powerful forces are seeking to drive natural gas from its place as the superior fuel," declared John A. Ferguson, of Washington, executive director of Independent Natural Gas Association, at its first annual meeting, held here at the Texas State Hotel January 28. Ferguson urged that the association assume leadership in a movement to prevent enemies of the industry from attaining their goal.

"Merely adopting resolutions and then remaining silent does not suffice," he said. "It is necessary that members take aggressive action to accomplish prevention of waste, ratable taking on an equitable basis, adequate enforcement of proper gas-oil ratios, and markets for accessible oil in solution with gas. We must work positively with state agencies to put into proper practice all these objectives. When this is accomplished there will be no waste, and no unconnected wells that may be economically connected. There will be more pipe lines and more markets."

Wesley E. Disney, of Tulsa, association counsel, and Charles L. Orr, in charge of the association's Oklahoma offices, were other speakers. Disney is chairman of the natural-gas industries committee, which is steering the industry's case in the Federal Power Commission's investigation.

The most significant resolution adopted was one advancing the principle of requiring ratable taking on an equitable basis, to preserve correlative rights and prevent improper withdrawals. It was also urged that the Bureau of Mines carry out a greatly enlarged research program on natural gas, and to this end the group recommended to Congress that sufficient funds be appropriated for that purpose.

All officers were reelected at the meeting, and six new directors were elected. These are: H. W. Bass, Dallas, president, Trinity Gas Corp.; Frank Buttram, Oklahoma City, president, Buttram Petroleum Corp.; B. A. Hardey, Shreveport, independent operator; D. A. Hulcy, president, Lone Star Gas Co.; F. S. Kelly, Jr., Shreveport, Arkansas-Louisiana Gas Co., and Homer W. Long, Guymon, Okla., independent operator.

It was announced that I.N.G.A.'s membership had grown to 1,280, representing 41 states.

Workers Reject O. W. I. U. As Bargaining Agent

CHARLESTON, W. Va.—Employes of Columbian Fuel Corp., which has oil and natural-gas production in Floyd, Johnson, Pike, and Knott counties, Kentucky, turned down a proposal to have Oil Workers International Union (C.I.O.) as their bargaining agent. Of 94 per cent of the employes who voted, 66 per cent opposed the union. J. Kenneth Tjoflat conducted the election for National Labor Relations Board.

DEATHS

Earl Oliver, petroleum engineer, geologist, and nationally known for his work in oil conservation, died January 24 at the home of a son in Knoxville, Tenn. Funeral rites and burial were in Ponca City, Okla., for many years his home. Oliver joined the old Marland Oil Co. in 1919 and became its director of economics. He was vice president and general manager of Marland Oil Co. of Mexico at the time of his resignation in 1925. After that he maintained an office as consultant in Ponca City, continuing his residence there until 1942.

Samuel H. Hunt, 83, retired independent oil operator, died January 28 in Tulsa.

Hardy Young, 45, chief pilot for Stanolind Oil & Gas Co., died of a heart attack January 28 in Tulsa. Young previously had served as a pilot for British American Oil Producing Co. in Tulsa, and for 6 months before joining Stanolind he was a member of the Royal Air Force in Montreal.

Roy Mead, 54, oil producer and drilling contractor of Tulsa, died January 26 in a Dallas hospital.

Harold K. Shearer, 50, Shreveport geologist, died in Bahia, Brazil, where he was doing geological work for Drilling & Exploration Co. of Dallas. He was sent to South America by the Government at the beginning of the war to explore the Amazon River and other regions for uranium for use in the atomic bomb.

Garfield N. Hess, 64, oil operator and drilling contractor in the Fern district of Pennsylvania, died January 22 in Oil City.

Victor H. Combs, 56, manager of Midwest Production Co., Tulsa, died from a gunshot wound January 24 in a Tulsa hotel. He had been in ill health.

L. M. Reynolds, 49, independent oil operator in Kansas, Illinois, and Oklahoma fields, died January 22 in Wewoka, Okla.

Delbert L. Jolly, 68, retired official of the Southwest Pennsylvania Pipeline Co., died January 19 in Washington, Pa.

William H. Huhn, 47, assistant to the head of the valuation engineering department of Sinclair Oil Co., died January 25 in Tulsa.

George Walker, 51, of Rew, McKean County, Pennsylvania, oil producer in the Bradford field, died January 25 in St. Petersburg, Fla. He and his brother, J. Blaine Walker, operated Walker Oil Co.

Pemex is still largely dependent in certain areas on railway and tank truck transport

Mexican Industry Seeks Gas

by Curtis Vinson

MEXICO CITY. — The growing industrialization of Mexico, particularly the northern part of the country, has given Petroleos Mexicanos (Pemex), the government's oil administration, an increasingly urgent problem to solve. That problem is adequate supplying of old and mushrooming new industrial plants with fuel.

The crux of this problem is not in the lack of sufficient volume of petroleum and its byproducts—although Mexico's domestic demand is increasing steadily—but in inadequate distribution facilities.

Pemex is engaged in an intensive program to remedy this situation. Existing refinery facilities in the more populous areas are being expanded—the Atzacapotzalco refinery enlargement at Mexico City for example. New refinery facilities in strategic locations to take the strain off existing plants are being planned—as in the case of the new plant being built at Salamanca in the state of Guanajuato, northwest of Mexico City. In addition bulk-storage facilities are being augmented throughout the country in order to make more readily available gasoline, fuel oil, and other needed products in areas far removed from production centers.

In the final analysis, however, Pemex is still dependent in large degree, so far as certain regions are concerned, upon railway and motor tank-truck transport. Railway transport is the most important at present. In consequence, by reason of disruption of rail service recently in widespread areas of the nation through strikes, certain regions have suffered a crucial shortage of fuel.

Northern Mexico, except along the international boundary where gasoline has been available through imports from the United States, has suffered particularly from this shortage. Monterrey, Mexico's Pittsburgh, center of the most pronounced industrial activity in the nation, has felt perhaps more keenly than any other one city the situation. Other cities hard hit have been Torreon in the state of Coahuila; Chihuahua, capital of state of the same name, and others.

By reason of this situation, one that not only is not new but that may come about again, industry in northern Mexico is seeking to protect itself against the future by assuring itself of a fuel supply not governed by the vicissitudes of rail strikes or other hindrances.

This is illustrated by the recent hearings in Washington by Federal Power Commission on application of Reynosa Pipeline Co., Corpus Christi, Tex., to export natural gas from Texas fields near the international border to Mexico for industrial use, chiefly at Monterrey in Nuevo Leon state. This question of exporting gas to Mexico was proposed some time back. The interest of Monterrey industrialists in getting gas for their plants is emphasized by the fact that 20 potential users of that city have organized Monterrey Industrial Gas Co. which proposes to finance a pipe line from the Mexican border city of Reynosa, in Tamaulipas, to Monterrey, a distance of about 145 miles, provided the Texas gas is obtainable. The Mexican Government has given its approval to this project.

Under the petition of the Reynosa company, a petition supported at the recent hearings by representatives of Monterrey industries, including Evaristo Araiza, general manager of Monterrey Iron and Steel Foundry, the gas for Mexican industries would come from Hidalgo County, Texas, fields. The Reynosa company, subsidiary of La Gloria Corp., reportedly advised that it could deliver 60,000,000 cu. ft. of gas daily to the Mexican border city of Reynosa.

In discussing Reynosa's petition to export gas, one U. S. representative favoring the project at the Washington hearings said that the Peñitas gas field in the area in question from which gas would be exported, comprising 4,100 acres on both sides of the Rio Grande, has calculated reserves of 6,240,000,000 cu. ft. of gas, of which geologists have estimated, 4,000,000,000 cu. ft. are on the Texas side. It was argued that the development of gas wells on the Mexican side, in case the petition should be refused, would make possible the draining off a large amount of the gas from the common reserve.

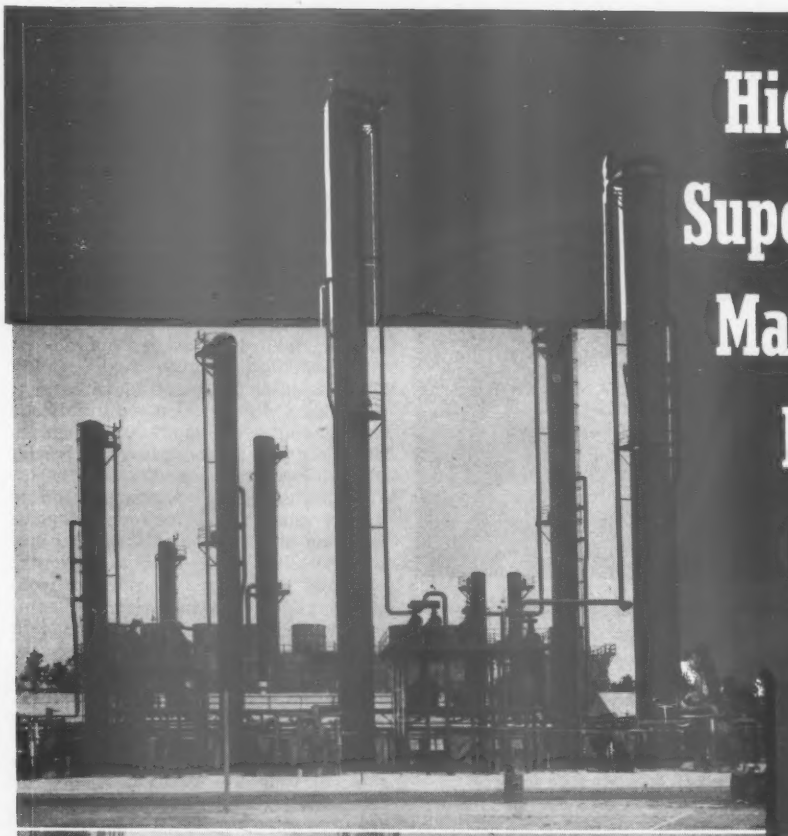
However this may be, Petroleos Mexicanos is carrying on an increasingly intensive search for oil and gas in Northeastern Mexico in the states of Tamaulipas and Veracruz. New findings to date have been limited largely to gas and gas distillate. The past April, a well producing 6,000,000 cu. ft. of gas and 40 bbl. of distillate daily was brought in at Mision, near Reynosa. Two geophysical parties are carrying on tests in the Reynosa district in the hope of developing production similar to that found north of the river in Texas in Willacy and Hidalgo counties.

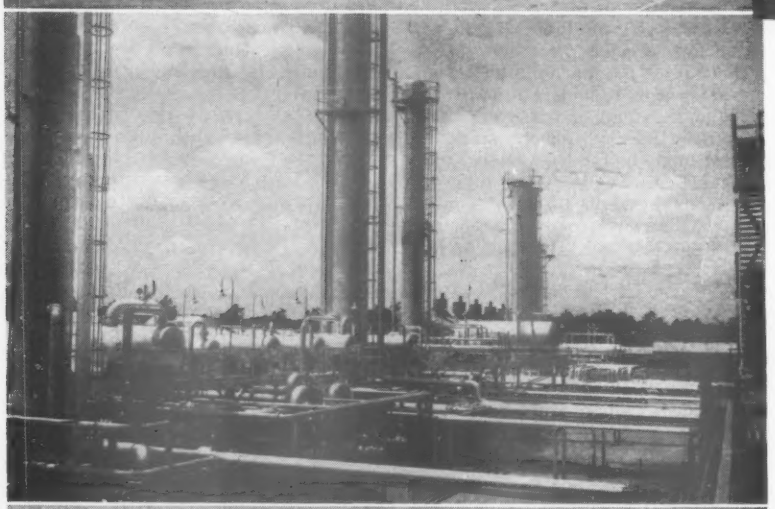
In any event it seems likely that industrial plants in Northern Mexico will in time get natural gas for fuel, whether from the U. S. or Mexico. Pemex is fully cognizant of this need and, judging from the exploration program under way in Northeastern Mexico, is endeavoring to do something about it.

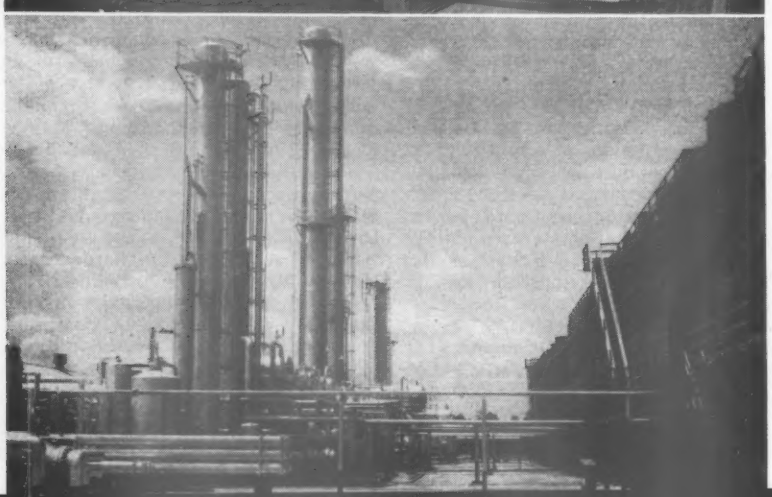
Discovery of oil and gas in major quantities in Northeastern Mexico would eliminate much of the headache of distribution that Pemex now suffers because of the northern regions. A new bulk-storage plant at Brownsville, Tex., is expected to aid much in service to the border area. But the Monterrey industrialists represent an ever-growing major market that may be expected to claim increasing attention from the nation's oil administration.

High Recovery, Superfractionation Mark Superior's Lake Creek Operations

by Arch L. Foster







DESIGNED to process 58 million cubic feet per day of wet cycle gas of an average C_3's-and-heavier content of 6.5 gal. per 1,000 cu. ft. Superior Oil Co.'s Lake Creek, Tex., gasoline-recovery plant utilizes recovery steps at two different pressure levels, combined with a highly efficient superfractionation system to obtain and purify an imposing list of products. This plant is part of the cycling system being applied to this field and is proving itself a satisfactorily efficient unit.

The plant may recover on the average 65,000 gal. per day of propane, 43,000 gal. of isobutane, 65,000 gal. of n-butane, 30,000 gal. of isopentanes, 150,000 gal. of isobutane and isopentane-free natural gasoline, along with 2,500 bbl. per day capacity for stabilized distillate. The latter product's range extends into that of gas oil and

Top: Fractionation unit, front, and distillation unit, rear, of the Superior Oil Co. plant at Lake Creek, Tex. Center: High-pressure still, distillate fractionator, low-pressure reabsorber, high-pressure absorber No. 1 and No. 2, and high-pressure reabsorber. Bottom: View of process cooling towers and absorption and distillation units. First still column is low-pressure still with kerosene stripper and oil purifier immediately in front. Remaining columns, left to right, are high-pressure still, distillate fractionator, low-pressure reabsorber, and high-pressure absorbers

yields kerosene and some motor-gasoline boiling-range material.

This plant was constructed when such products essential to the war effort was a necessity; consequently, careful attention was given to detail and design in order to provide the maximum yield of all such special products and at the same time insure flexibility in order to produce the products demanded by a highly competitive, postwar market. This list includes 97+ per cent pure propane, isobutane, normal butane, and isopentane and blends of these liquefied gases for the chemical or petroleum industries and domestic market, in addition to a wide variety of natural gasolines, naphtha stocks, and motor-gasoline base stocks.

The Lake Creek cycling plant is very similar in general operation to other modern cycling plants probably for the exception that it embodies several distinctive and proven features which are as follows:

1. Propane refrigeration system to control effectively the gas and oil temperature, a major factor in a plant recovery of 90+ per cent of propane and heavier.

2. Automatic gas injection temperature control with a completely insulated gas-gathering and injection system and all lines installed aboveground.

3. Automatic booster compressors, consisting of two 225-hp. Ingersoll-Rand units, located in a remote area, increasing the discharge pressure on any desired proportion of the injection gas from 4,100 to 4,900 psi., eliminating the necessity of additional injection wells.

4. Speed and pressure, also packing-gland temperature controls.

5. Simplicity and streamlining of plant, an aid to operation with provision for expansion.

1. Propane Refrigeration System

The refrigeration system was designed not only for the purpose of maintaining the maximum yield of all products under all conditions, but minimizing the fluctuation in operating performances prevalent through varying conditions of humidity, pressures, temperature, etc. This precision control of operating temperatures, impossible to attain or minimize to any exacting degree through the medium of standard cooling towers and condensers, further provides for operations at a much lower and naturally efficient temperatures.

This system consists of five propane chillers of the shell-and-tube type located at critical control points in the flow stream of gas, oil, or liquids. The gas or liquid while being precooled passes through the tubes of these condensers while the propane chilling fluid is vaporized in the shell of these exchangers surrounding these tubes. Temperature of the propane fluid leaving these chillers is controlled through a thermostatically operated motor valve regulating the rate of flow of propane vapors from the shell; such vapors then return to a 225-hp. Ingersoll-Rand gas - engine-driven propane - recovery compressor which in turn recompresses such vapor for further chilling.

The above propane chiller units are located at the following points in the different flow streams:

(a) On the formation gas entering the 1,500-psi. separators. Results of this precooling increase the liquid condensation; thus relieving the load on the absorbers.

(b) The lean oil is also precooled to a predetermined temperature before entering the absorbers with a resultant increase in the recovery of lighter hydrocarbon fractions on a minimum rate of oil circulation.

(c) Two propane chillers operating as inter-precoolers on the low-pressure reabsorber subcool the oil removed from the twelfth tray and returned to the thirteenth tray, repeating this procedure between the twentieth tray and twenty-first, respectively.

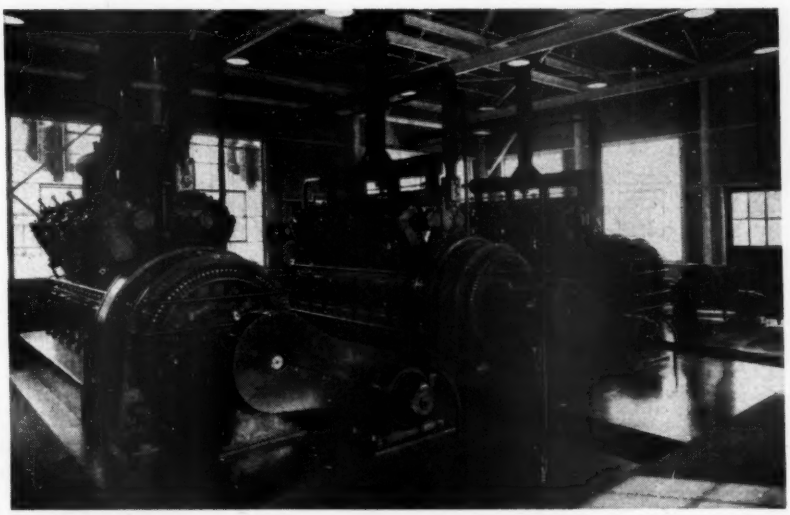
(d) Propane chilling is applied to the excess reflux from the secondary condenser of the distillate fractionator to accomplish total condensation.

(e) The final propane chilling controls the excess reflux from the stills and the distillate fractionator as it enters the charge tank to the deethanizer. Precooling at this point has the affect of minimizing flash gases, retaining a much higher percentage of the lighter hydrocarbons, which it would otherwise be necessary to reabsorb.

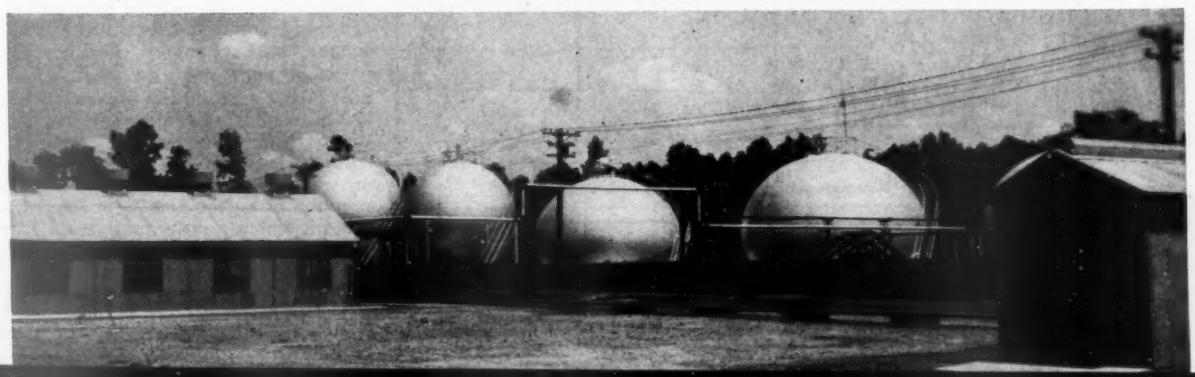
2. Automatic Temperature Control

The complete high-pressure 2,000-psi. gas-gathering system and the 5,000-psi. gas-injection system, and the two (800 and 300-psi.) low-pressure systems since installed, consisting of 6 and 8-in. main lines with 2 and 4-in. laterals, are laid throughout above the ground upon small concrete piers varying from 6 in. to 1 ft. in height and spaced on 20-ft. centers with sufficient provisions made for expansion and pipe guides, the latter

(Continued on page 78)



Right: View of generator plant. Below: Shipping pump house at extreme left, and pressure storage tanks in center. The tank at extreme left is normal butane storage. Second from left is isobutane storage, and the others are isopentane storage and gasoline storage



FUTURE OIL POSSIBILITIES OF NEW MEXICO

by Robert L. Bates

ALTHOUGH New Mexico produces more than 100,000 bbl. of oil daily, this production is concentrated in two small geographic areas of the state, the bulk in the southeast corner, and a smaller volume in the northwest corner. In terms of geographic area, most of the state remains undeveloped.

The purpose of this article is to examine the nonproducing areas to determine their future oil possibilities, using Levorsen's four major criteria for evaluating the possibilities of any given region. These are (1) thickness of sedimentary rocks; (2) evidences of oil and gas, such as seeps, shows in wildcats, etc.; (3) effects of unconformities; (4) wedge belts of porosity; and, in addition, because we are concerned with smaller areas; (5) geologic structure.

These criteria are applied to each of five areas of the state (see Fig. 1), as a means of measuring future oil possibilities. For convenience and reference, a correlation chart (see Fig. 2) has been added, listing the formations in the parts of the state considered to have appreciable future oil possibilities.

It will be evident, after considering each area in detail, that roughly three-quarters of New Mexico has more or less promising future oil possibilities. To realize these possibilities without prohibitive expense will necessitate a revision of some of the exploration policies that have formerly prevailed in New Mexico.

Robert L. Bates graduated in geology from Cornell in 1934, and since receiving his doctor's degree at the State University of Iowa in 1938 has been engaged in petroleum geology in West Texas and New Mexico. After 2½ years with The Texas Co. in the Permian basin he joined the New Mexico Bureau of Mines and Mineral Resources, becoming chief of the Oil and Gas Division in 1944. He is the compiler of the bureau's Bulletin 18, "The Oil and Gas Resources of New Mexico," and is the author of shorter papers on New Mexico geology.

The oil will not be found by drilling wildcats located solely because of convenient access or position of leased acreage, or on the basis of outdated geological concepts, or by accepting the advice of that fringe of so-called geologists who write enthusiastic reports based on a few days' field work.

To find these potential oil reserves, future wildcatting must be based on the best geological evidence, surface and subsurface, aided and abetted by geophysics. Specifically in Area 2, the possibility of reefing in the pre-Permian strata needs to be investigated. The number and distribution of lenticular sands in the Cretaceous of the San Juan basin is worthy of examination. Locating and exploring the buried belt along which the Paleozoic limestones of the San Juan basin wedge out against surrounding old land masses offers many challenges to good geology.

Other examples are northeastern and East Central New Mexico, which are in need of reexamination from the point of view that many of the so-called structures are not true folded anticlines, but merely the surface expression of buried pre-Cambrian hills, around which stratigraphic traps may be expected (see Fig. 3).

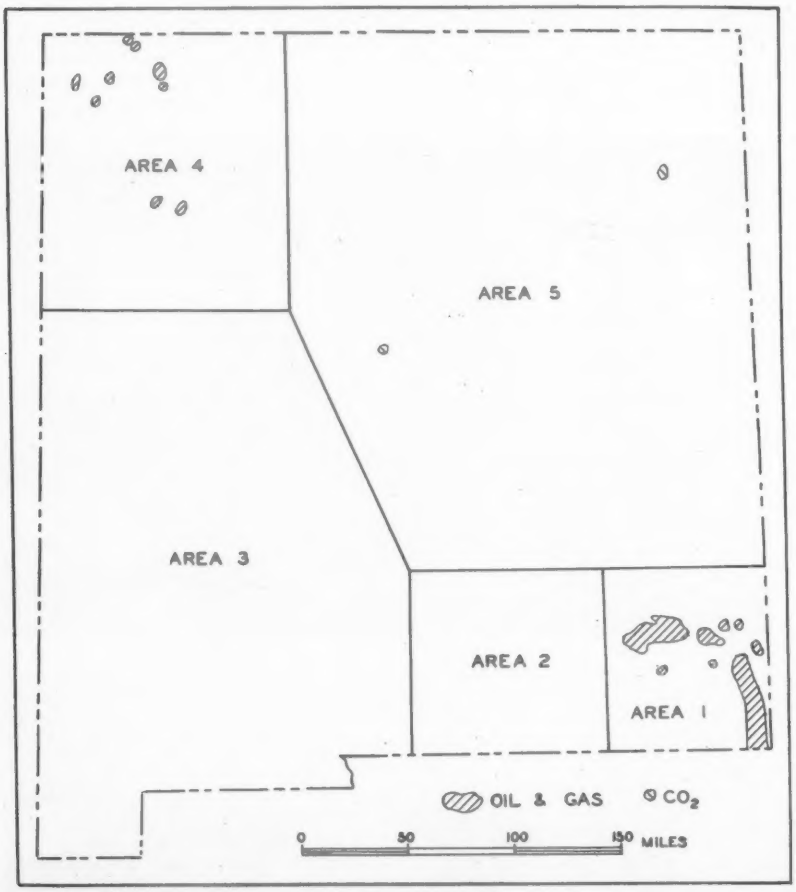


Fig. 1—Index map of New Mexico showing areas discussed and producing districts

Area 1

The present producing area of southeastern New Mexico (Fig. 1) provides in many ways an excellent example for application of the five criteria of future oil possibilities. There are in the vicinity of 10,000 ft. of sedimentary rocks beneath the surface. In terms of volume, making the conservative estimate of an average sedimentary thickness of 1¾ miles for this corner of New Mexico, there are over 11,000 cubic miles of sediments in which oil and gas might be expected—and from which, indeed, they have been produced in large amounts. These sediments are mostly marine in origin; they are free from metamorphism; and they are highly variable in composition.

A feature of the area's sediments is the buried Capitan limestone reef, of Permian age, on or near which lie many of the great oil accumulations of southeastern New Mexico.

As to the second factor, evidences of oil and gas, certainly we cannot

AGE	NORTHWESTERN NEW MEXICO	NORTH CENTRAL AND NORTHEASTERN NEW MEXICO	SOUTHEASTERN NEW MEXICO
PLEISTOCENE			"Mescalero sands" Gatuña fm. 25±
TERTIARY — PLIOCENE		Santa Fe fm. 2000± Abiquiu fm. 0-1200 ElRito fm. 0-500 | Popotosa fm. 3000± | Ogallala fm. 0-500	Ogallala fm. 150±
TERTIARY — MIOCENE			
TERTIARY — OLIGOCENE		Galisteo fm. 700-3790	
TERTIARY — EOCENE	Chuska ss. 700-900 | Wasatch fm. 1000 Torrejon fm. 275 Tohatchi sh. 200-1100 | Puerco fm. 1200±	Raton fm. 600-2000	
CRETACEOUS	Ojo Alamo ss. 50-170 McDermott fm. 30-200 Kirtland sh. 700-1180 | Farmington ss. 0-480 Fruitland fm. 190-530 Pictured Cliffs ss. 50-275 Lewis sh. 75-1800 Mesaverde group 300-2000 Mancos sh. 725-2000 | Tocito ss. 0-35 Dakota ss. 50-250	Vermejo fm. 425 Trinidad ss. 70-100 Pierre sh. 0-2500 Niobrara fm. 550 Carlile sh. 150-720 Greenhorn ls. 25-40 Graneros sh. 60-350 Dakota ss. 20-200 Purgatoire fm. 0-50	Lower Cretaceous 0-250
JURASSIC	Morrison fm. 300-600 San Rafael group 0-40 Navajo ss. 100 Kayenta ss. 40 Todilto fm. 0-100 Wingate ss. 300	Morrison fm. 0-100 Todilto fm. 0-50 Wingate ss. 0-150	
TRIASSIC	Chinle fm. 1500±	Chinle sh. 1000± Santa Rosa ss. 50-200	Dockum group 1100-1550
PERMIAN	Cutler fm. 1400±	Redbeds and evaporites 0-1000 San Andres fm. 15-400 Glorieta ss. 175-500 Yeso fm. 750± Abo fm. 1000± | Sangre de Cristo fm. 250-1800	Dewey Lake fm. 75-200 Rustler fm. 150-250 Salado fm. 1000-2000 Castile fm. 0-1500 → Tansill fm. 100-200 | Capitan reef | Delaware Mtn. gr. 2700± Yates ss. 200-300 Seven Rivers fm. 350± Queen fm. 400± Grayburg fm. 300± San Andres ls. 400-1200 Glorieta ss. 10-100 Yeso fm. 1750-2350 | Upper Yeso 960-1400 | Lower Leonard lss. 1040-1550 | Bone Spg. ls. 2500± Abo fm. 900 Hueco (?) ls. 350
PENNSYLVANIAN	Hermosa fm. 1000-1300 Molas fm. 30-70	Madera fm. 0-2000 Sandia fm. 0-430	Ls. and dol. 525-1200
MISSISSIPPIAN	Leadville ls. 150-200		Lake Valley ls. 230-475 Caballero siliceous sh. 318-510
DEVONIAN	Ouray ls. Elbert fm. 150±		Cherty ls. and dol. 600-1470
SILURIAN			
ORDOVICIAN			Montoya ls. 300-425 Simpson fm. 580-1060 Ellenburger fm. 300-445
CAMBRIAN	Ignacio quartzite 2+		
PRE-CAMBRIAN	Granite and schist	Granite, schist and quartzite	Granite, diabase (?), and quartzite

Fig. 2—Generalized correlation of geologic formations in northern and southeastern New Mexico

consider an annual oil production of nearly 40,000,000 bbl. anything less than excellent evidence. It is of interest to note, in view of the variability of the sediments mentioned above, that indications of oil are present in sandstones, bedded limestones, and massive reef limestones.

Thirdly, there are at least five "layers of geology" separated by regional unconformities: Tertiary, Triassic, Permian, Pennsylvanian, and pre-Pennsylvanian. The sediments and their attitudes within each layer are different from those of the others. The Tertiary and Triassic layers have been tried and found wanting—in part because much of their sediments are nonmarine. The Permian layer has produced well over 400,000,000 bbl. of oil. The pre-Permian layers are now being actively prospected, and promising production has already been secured (R. E. King, 1945).

Wedge belts of porosity are well represented. An excellent example on a small scale is the so-called "sand belt of southeastern Lea County, where oil has accumulated in sandstones that wedge out updip toward the east (Denham and Dougherty, 1941; Bates and others, 1942, pp. 230-235). Other pools have formed where porous zones, either in sandstones or porous limestones, wedge out—generally, as in the sand belt, in an east, northeast, or north direction, away from the Delaware basin enclosed by the Capitan reef. Indeed, as Levorsen (1943, Fig. 9) points out, the whole arc of oil fields extending from southeast Lea County nearly to Carlsbad may be considered to lie along a regional wedging out of porosity away from the Delaware basin and toward the more compact and partly nonmarine sediments to the east, north and west.

While there are no evidences of favorable geologic structure at the surface or in the highest layer of geology, there is much evidence at depth. One has only to look at a subsurface contour map of the Hobbs or Eunice-Monument fields to appreciate this.

We arrive, then, at the more or less obvious conclusion that there are definitely possibilities of future oil production in the present producing area of southeastern New Mexico. In fact, new pools are constantly being discovered in Permian rocks, and the prospects in the pre-Permian appear to be excellent.

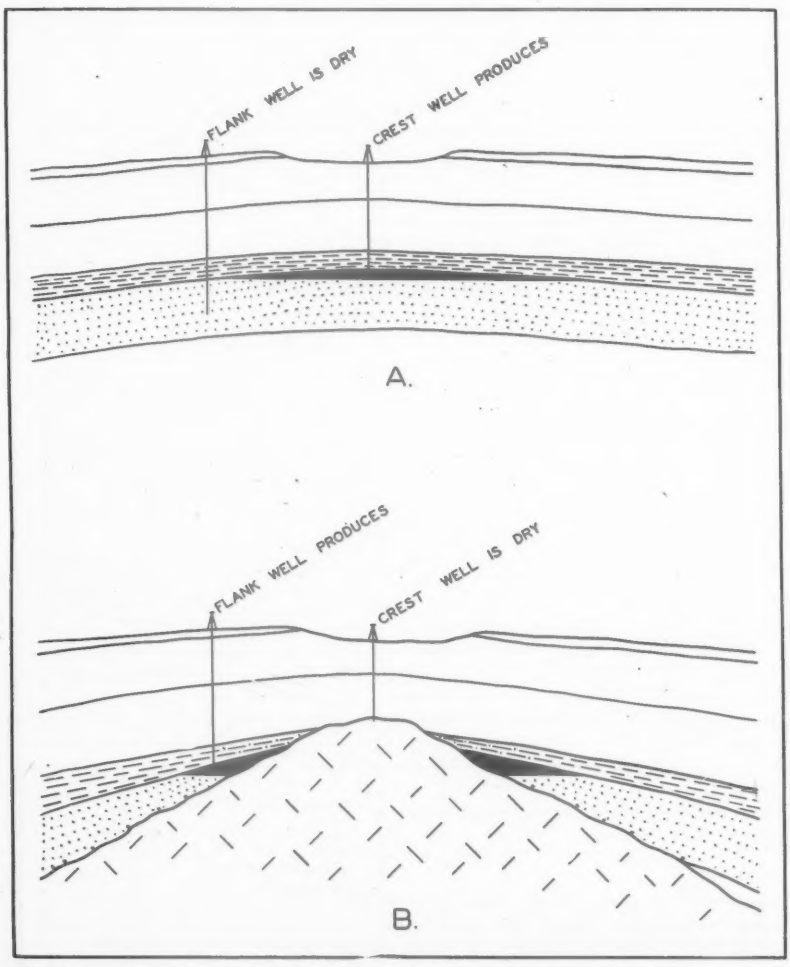


Fig. 3—Hypothetical cross sections. A—through a true anticline. B—through a buried pre-Cambrian hill. Surface expression of A and B are identical

Area 2

Consider now a rectangular area adjacent to Area 1 on the west (Fig. 1). Included in it are the Guadalupe Mountains and foothills, the Sacramento Mountains and foothills, Crow Flat west of the Guadalupes, and a wide area of mesas still farther west.

Several thousand feet of sedimentary rocks are present over all the area except possibly parts of the mesa country in the southwest and parts of the Sacramento Range. Even in these places there are apparently between 1,900 and 4,000 ft. of sediments above the pre-Cambrian basement. The beds are nonmetamorphosed. A combination of factors, however, seems to rule out much of the Permian strata from oil possibilities. The equivalents of sediments that produce oil in and above the reef zone east of Carlsbad—the Seven Rivers, Queen, and Grayburg formations (Fig. 2)—have been drilled at numerous places in the Guadalupe foothills and have been found to consist dominantly of uniform dense bedded limestone; the subcriterion of variation in sediments is lacking. Over the rest of the area these beds have been removed by erosion, and the underlying San Andres limestone, that also produces oil to the east, is exposed at the surface. Consequently we will have to consider possibilities in lower San Andres and older beds.

Immediately, however, we are faced with the question, are the lower Permian strata marine? So far as we know, they are marine in roughly the eastern half of the area; westward they grade laterally into such unfavorable shallow-water or continental types of rock as gypsum, silty red shale, and arkose.

Turning for a moment to the subject of reefs, it has been shown (P. B. King, 1942, Fig. 2) that around the Delaware basin the upper, younger reef masses are found on the rim of the basin, and the lower, older reef masses are progressively farther back, toward the area in which we are now interested. It has occurred to some geologists that possibly reefs in older beds than those forming the Capitan reef—say in the Yeso formation beneath the San Andres limestone—may be encountered by drilling to moderate depths in the Guadalupe Mountains.

Moving downward in the section, across a regional unconformity into Pennsylvanian and older strata, we find our knowledge much less complete; but nevertheless certain favorable factors appear. Beds of Pennsylvanian, Mississippian, Devonian,

Silurian, and Ordovician ages seem to be marine. They present a rather variable lithology. They have not been regionally metamorphosed; they are thick enough to produce oil; and certain of them contain reefs. Laudon and Bowsher (1941) have shown the existence of quite sizable limestone-reef masses in Mississippian rocks exposed on the west escarpment of the Sacramento Mountains. It is possible that Mississippian reefs might be encountered by the drill down the dip toward the east.

Evidences of oil and gas in Area 2 range from slight to nil. Slight shows have been reported from wildcat tests—which, it might be noted, are extremely few and far between. No oil seeps have been reported. Unconformities, with their intervening layers of geology, certainly exist. The one at the base of the Permian may be seen beveling Pennsylvanian sediments in the Sacramento Mountains; possibly truncated Pennsylvanian structures may be found in the subsurface toward the east. Other regional unconformities are present in the lower section. Evidence on wedge belts of porosity is meager, in both Permian and pre-Permian strata.

Known structures in this area include a prominent one along the Huapache monocline that forms the east edge of the Guadalupes, and numerous large ones in the Sacramento foothills from south of Pinon north to the Hondo Valley. There is even some evidence of west closure on the whole Sacramento Mountain mass, which may turn out on further study to be an irregular dome rather than a simple block dipping uniformly eastward.

The application of the five criteria to this part of New Mexico definitely indicates future possibilities. These are probably poorest in the mesa country west of the Guadalupe Mountains and along the west fronts of these mountains and the Sacramentos; they are better in the eastern parts of the mountain ranges and in the bordering foothills.

Area 3

We may now consider a much larger region—one that embraces some 34,000 sq. miles of deserts, plateaus, and mountains. In it are included the western part of the state from the Mexican boundary north to approximately the latitude of Albuquerque (Fig. 1).

In discussing the sedimentary rocks of this large region we are forced to proceed with caution, for there are great areas about whose sediments little is known. Whereas the sediments have been studied intensively in certain mining districts—for example, the Organ Mountain, Silver City, and Lordsburg districts—and have been described rather disconnectedly from surface outcrops in some of the mountain ranges, very few wildcat tests have been drilled and consequently we lack the broad subsurface information that we have in other parts of the state. It is impossible to examine the sediments at the surface, for over four-fifths of the area they are covered by thick alluvial deposits and lava flows.

Notwithstanding these limitations, we can safely make certain generalities regarding the layer of geology between the base of the alluvium and the top of the pre-Cambrian. The sediments, for one thing, become thinner toward the west. Whereas in the San Andres and Organ Mountains, in the eastern part of the area, they total some 5,000 ft. in thickness, in the Silver City mining district, in the western part, they are only about 2,500 ft. thick. All the Paleozoic systems, except possibly the Cambrian, are represented; and there are Cretaceous strata in the eastern part of the region. All these rocks except the Abo and Yeso formations of Permian age are marine, and they are rather variable in composition. But they cannot be considered untouched by metamorphism; they have been intruded, silicified, folded, faulted, and intensely mineralized in many of the outcropping areas. We can only surmise that in the inaccessible depths, below the valley fill and lava flows, these rocks may likewise be much deformed, contact metamorphosed, and impregnated with introduced mineral matter.

The Tertiary and Quaternary sediments that fill basins in the older rocks to a thickness of several thousand feet in places consist chiefly of unconsolidated sands and gravels. Limestones and appreciable amounts of organic matter are, so far as known, notably absent. The beds are not marine but are of continental origin.

Evidences of oil and gas are confined to the eastern part of the area. Slight shows were logged in a deep test in the Tularosa basin, and an oil seep is reported in southern Jornada del Muerto.

Unconformities are present in such numbers as to divide the rocks into perhaps too many layers of geology. A recent report on the Silver City mining area (Entwistle. 1944) lists eight major unconformities in a thickness of 2,700 ft. of strata. Not all these breaks are angular, but nevertheless each represents changing sedimentary and environmental conditions.

The existence and alignment of wedge belts of porosity in the area is problematical. Both this matter and the possible presence of favorable structures will have to await future work.

It seems, then, a reasonable conclusion that the oil possibilities of southwestern and central western New Mexico are relatively slight—at least with our present knowledge. Two large structural features on the east side of the region, the Tularosa Valley and Jornada del Muerto, may prove to have the requisite sedimentary section and structural conditions; but even these areas do not at present appear very encouraging. The remainder of the region must be classified as relatively unfavorable.

Area 4

An area of some 10,000 sq. mi. in the northwestern part of the state (Fig. 1) is underlain by a regional geologic feature known as the San Juan basin. This basin extends into Colorado and Utah, but the main part of it lies in New Mexico. It is bounded by the Fort Defiance uplift on the west, the Zuni Mountains on the south, the Nacimiento Range on the east, and the San Juan Mountains on the northeast. Only toward the northwest is the basin without an enclosing mountain mass.

In 1939 a deep test was drilled on the Rattlesnake anticline in the western part of the basin, and it was found that there are 7,400 ft. of sediments between the Tocito sandstone of Upper Cretaceous age at the surface and the Ignacio quartzite of Cambrian age at total depth of the well. As some 6,600 ft. of sediments younger than the Tocito can be measured in surface exposures toward the center of the basin, we arrive at a figure of at least 14,000 ft. for the total thickness of sediments in the middle part of the San Juan basin.

Very briefly, these sediments are constituted as follows: The Tertiary consists of about 2,000 ft. of freshwater sandstones and shales; the Upper Cretaceous, of approximately 6,400 ft. of alternating marine and nonmarine sandstones and shales; the Jurassic, Triassic and Permian, of redbeds and sandstones of continental origin to a thickness of about 4,000 ft.; the Pennsylvanian, Mississippian, and Devonian, of 1,600 ft. of marine limestone; and the Cambrian, of quartzite. Ordovician and Silurian rocks are apparently absent.

Taking the section as a whole, we can make these statements: The sediments are very thick. They show considerable variation in lithology — although it might be noted in passing that there is no thick evaporite section, as in southeastern New Mexico, nor has any reefing been identified in the limestone section. The strata are not metamorphosed. The presence of intrusions such as Ship Rock has apparently had no appreciable effect on the sediments, although there are those who believe the Ship Rock intrusion has had some effect on the oil in the neighboring Rattlesnake pool.

Evidences of oil and gas are abundant. Commercial production is obtained from 12 localities, and oil and gas shows ranging from slight to considerable have been encountered at many other places (Bates and others,

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1942, pp. 88-90). Production comes from sandstones in the Upper Cretaceous and from limestones in the Paleozoic part of the section.

The Rattlesnake pool is of special interest in this connection. For one thing, it lies within 3 miles of an igneous intrusion. Secondly, it has a three-fold pay section: oil from the Dakota sandstone, oil from the Hermosa limestone, and gas from the Ouray-Leadville limestone sequence (Bass, 1944). Thirdly, the oil from the Dakota is of exceptionally high gravity, running as high as 76° A.P.I. when it comes from the well. Lastly, the gas obtained from the Ouray-Leadville has a high content of helium.

There is an angular unconformity at the base of the Tertiary; of the regional unconformities in the pre-Tertiary sediments none is angular except locally. Even though, however, all the sediments from Cambrian to Upper Cretaceous are essentially parallel, layers of geology are quite distinct, and have, as noted above, a direct bearing on oil and gas possibilities. In the upper layer that produces, the Upper Cretaceous sandstone and shale sequence, there are dozens of minor, local unconformities. They produce a section consisting of thin sheet sandstones that wedge out, thicken and thin, and overlap in the enclosing mass of shales (Sears, Hunt and Hendricks, 1941). An exception to this tendency of sandstones to appear and disappear along local unconformities is the Dakota sandstone, which is continuous through the entire area and, indeed, through much of the Rocky Mountain region and the plains to the east.

Owing to the presence of the numerous local unconformities in the Upper Cretaceous section, there are a like number of small local wedge belts of porosity. Oil or gas, or both, are being produced from seven of these stratigraphic traps; an example is the Bloomfield pool, where oil and gas have accumulated in shale-sealed lenses of sand in the Farmington sandstone.

Regional and highly interesting wedge belts of porosity undoubtedly exist in the Pennsylvanian and older limestones. Although we know from deep drilling in the basin that these limestones are many hundreds of feet thick and contain evidences of oil and gas, we also know that on the surrounding ancient land masses — the Zuni Mountains, for example—they are very thin or absent and younger strata are close to or directly on the pre-Cambrian. The conclusion cannot be escaped that the marine limestones are overlapped by younger strata on the flanks of the old land masses. It would seem well worth while to investigate the possibilities of testing these limestones around the margins of the basin.

No less than 45 geologic structures have been recognized in the New Mexico part of the San Juan basin. Two-thirds of these have been drilled, at least as far as the Dakota sandstone, and seven have made commercial production. So far as the upper productive layer is concerned, structure is undoubtedly the most important single factor in oil and gas accumulation.

But we cannot escape noticing that the Upper Cretaceous formations of the San Juan basin, even with their local stratigraphic traps and their abundant structures, account for only a little more than 1 per cent of New Mexico's annual production. Why is this? From a region underlain by some 7,000 ft. of shales high in organic matter, interbedded with porous sandstones that lens out and have been folded into suitable structures, why are the results to date so meager?

Disregarding the nongeologic factor of retarded development due to distance from markets, there seems to be an answer. In the first place, according to a report by E. W. Krampert (1934), fully 90 per cent of the structures in the Rocky Mountain region as a whole have been flushed of their oil and gas by migrating underground waters. Krampert says: "The otherwise favorable structures about the rim of the San Juan basin in northwestern New Mexico are generally barren excepting the northwest end, which, being topographically low, is the spillway for waters entering the reservoir sands at their outcrops on the periphery of the basin. The waters move from the outcrops adjoining the mountains through the structures and against the direction of oil migration from the basin to these structures. The oil entering the reservoir sands is carried northwestward toward the outlet, where some of it is trapped in suitable structures. The water escapes from the topographically low outcrops through springs." Whether or not this analysis is accurate—and it does not seem to take into account the commercial accumulations in the southern part of the basin, as at the Hospah dome in McKinley County—there is little doubt that the flushing action of underground waters in the San Juan basin has rendered many of the pools smaller than they might have been and has encroached heavily on the productive structures.

According to Levorsen (1943, p. 902), "Theoretically, the Dakota group of sandstones . . . of the Rocky Mountain region should be one of the most prolific oil-and-gas-producing formations of the United States." In attempting to account for its relatively poor showing, he points out that the large volumes of oil and gas that might be expected to have accumulated in the Dakota before the mountain-making movements at the end of the Cretaceous time would have been removed by erosion when the Dakota and overlying rocks, having been arched into open folds containing oil, were beveled off to make the profound angular unconformity now seen at the base of the Tertiary. Thus, only small remnants of the original oil and gas content were left in the Dakota, in regionally low areas such as the San Juan basin.

Structures in the lower productive layer of geology, the Paleozoic limestones, have given results of enough interest to justify further exploration. The Rattlesnake anticline contains, as noted above, oil in the Hermosa formation and helium gas in the Ouray-Leadville limestones; the Tocito dome gave a large show of gas from the Ouray - Leadville; and the Barker dome contains commercial amounts of gas in Pennsylvanian beds. If, around the edges of the basin, structures can be found that are superimposed on the regional wedging out of these Paleozoic strata, such structures can be expected to produce oil and gas in larger amounts than have heretofore been recovered in the San Juan basin.

Area 5

This area includes all or part of 20 counties (Fig. 1), and embraces the Sangre de Cristo Mountains and foothills, Glorieta Mesa, the Estancia Valley, the Pedernal Hills, Chupadera Mesa, and the great area of plains and mesas lying to the south and east. It is a varied region, both geologically and topographically.

The sedimentary rocks range in age from Pennsylvanian to Recent; pre-Pennsylvanian sediments are apparently absent. The thickness varies widely. It is, of course, zero where pre-Cambrian rocks are exposed in the Sangre de Cristo Mountains, the Pedernal Hills, and small pre-Cambrian outcrops northwest and southeast of the Pedernals; also in the southwest part of the area where Tertiary intrusives are exposed in the Gallina and Capitan Mountains and Sierra Blanca. Away from the mountains, the sedimentary cover in the northern two-thirds of the area ranges from less than 2,500 ft. over some buried pre-Cambrian hills to as much as 6,700 ft. over others. Thicknesses in the intervening troughs are unknown but must be in the vicinity of 8,000 or 9,000 ft. A test in the southeastern corner of the area penetrated 7,920 ft. of sediments before reaching the pre-Cambrian.

The wide range in sedimentary thickness in Area 5 results from the roughness of the pre-Cambrian surface on which the sediments rest. In the northern part of the area this surface is mountainous; in the central part, hilly; and in the southern part gently sloping toward the depths of the Permian basin to the southeast. The Sangre de Cristo Mountains and the buried Sierra Grande Arch on the north give way southward to a wide area that contains dozens of buried pre - Cambrian hills ("structures"), both isolated and in clusters, and

these in turn seem to become less prominent and more deeply buried to the southeast. The highly uneven character of the pre-Cambrian surface is probably the result of regional normal faulting — some of which may have taken place as early as medial Pennsylvanian time and some of which was much later—combined with the erosion that would naturally follow.

The character of the sediments is highly variable. Marine limestone, shale, and sandstone; lagoonal gypsum and silt; and continental redbeds and arkose are all represented. The rocks are nonmetamorphosed.

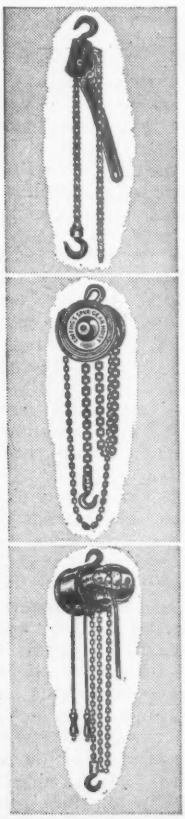
Evidences of oil and gas are numerous. Surface seeps and appreciable shows in shallow water wells have been observed in the upper Pecos Valley (Read and Andrews, 1944), and seeps have been found in Pennsylvanian limestones in the Sangre de Cristo foothills west of Las Vegas. Shows have also been reported from several wildcat tests drilled for oil in the plains country to the east. There is a saturated oil sand near Santa Rosa, which has been used as an asphalt rock. A gas seep has been reported from a creek bed in Union County; a sample of the gas was analyzed by the U. S. Bureau of Mines and was found to be a hydrocarbon gas similar in composition to that from the Borger field in the Texas Panhandle (Bates and others, 1942, p. 155). The occurrence of carbon dioxide gas in commercial quantities at two localities in northeastern New Mexico is evidence that adequate porosity exists in certain areas. Finally, there are thick black shales in the Pennsylvanian section of the Sangre de Cristo Mountains — presumably good source rocks where buried.

Unconformities are present and highly important from the point of view of oil and gas possibilities. As elsewhere, they separate the layers of geology. These consist roughly of Cretaceous marine sandstone and shale; Jurassic and Triassic redbeds; Permian redbeds, evaporites, and limestones; and Pennsylvanian arkose and marine limestones. The Cretaceous sandstones and shales are present only in the area northeast of Las Vegas. Besides separating the layers, however, the unconformities are important because they all eventually merge with the profound unconformity at the top of the pre-Cambrian. This means that, where a pre-Cambrian high extends up through the sediments, the lower layers of geology are progressively overlapped by the higher ones, along the regional unconformities.

Layers of geology that may produce oil and gas in Area 5 are not numerous. The one that has the widest regional extent is the marine limestone of Pennsylvanian age. From surface evidence, including seeps, and from shows in wells, this is a relatively good prospective zone. Two others, about which less is known, are the thick arkoses—the so-called granite wash—of the upper Pennsylvanian and lower Permian, and the Dakota sandstone. The arkoses are of interest because they are in part porous, they are associated with possible source beds in the limestones and shales, and they are thought to overlap into pre-Cambrian masses; comparison is suggested between this part of the section in northeastern New Mexico and the section in the Panhandle oil and gas field near Amarillo. Possibilities from the Dakota sandstone are problematical; however, it is buried between considerable thicknesses of Cretaceous shale in an area in central Colfax County and should be worth testing.

The preceding discussion of unconformities and overlapping relations logically brings us to the subject of wedges of porosity. That such wedge belts are present and largely unexplored in northeastern New Mexico cannot be overemphasized. Many tests have been drilled in the plains area, and to date they have all been dry; but they have all been located on the top of apparent structures. Until recently it was not realized that many of these so-called structures are in reality not anticlinal folds (Fig. 3A), but reflections of pre-Cambrian highs (Fig. 3B). Consequently it is only natural that wells drilled on their crests should find a relatively thin and unfavorable sedimentary succession and should then enter pre-Cambrian schist or granite. But in proportion as the possibilities of conventional anticlinal production are reduced, the possibilities of production from wedging-out strata on the flanks of these highs is stepped up. More than 2 years ago Levorsen (1943, Fig. 17) pointed out that there are miles of unexplored wedge-belts of porosity around the Pedernal pre-Cambrian mass; and around every buried knob or ridge of pre-Cambrian rock in northeastern New Mexico we may expect to find Pennsylvanian limestones and Permo-Pennsylvanian arkoses wedging out. Surely a more stimulating set of wedge-belts of porosity was never set before the oil and gas operator!

Warren L. Baker, manager of Socony-Vacuum Oil Co.'s aviation department, has been elected vice president of the New York Board of Trade. He also became a member of the board of directors of the same organization. During the past year Baker has served as chairman of the board's fuels and lubricants committee, aviation section. During World War 1 he was a flyer with the French Foreign Legion, and was decorated with the Croix de Guerre. He has been with Socony-Vacuum since 1919.



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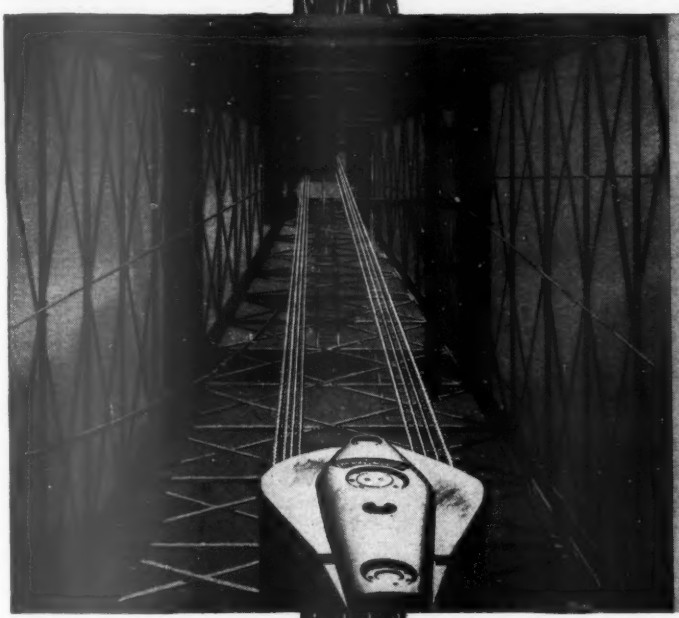

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QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Velocity in Shell of Exchanger

How do you estimate the fluid velocity in the shell of a heat exchanger? What do you consider to be the best method?—G.A.C.

No one can feel satisfied with methods of computing fluid velocity unless he thoroughly understands the derivation of the method and all of the assumptions or simplifications that were made. This is seldom completely possible but I do direct you to the following:

Short & Stack — The Oil and Gas Journal, May 10, 1934, p. 115.

Colburn, A. P.—A Method of Correlating Forced Convection Heat Transfer Data and a Comparison with Fluid Friction, Trans. A.I.Ch.E. 29, 174, 1933.

Bowman, R. A. — Investigation of Heat Transfer Rates on the Externa Surface of Tube Bends. Annual Meeting A.S.M.E., New York, 1934.

Buthod & Whitely—Shell Side Film Coefficients and Pressure Drop Shell Side of Tubular Heat Exchangers, The Oil and Gas Journal, August 26, p. 129, September 16, p. 91, 1944.

Chilton & Genereaux — Pressure Drop Across Tube Bends. Trans. A.I.Ch.E., 29, 161, 1933.

So many variables are involved that generalized equations are of little value. At different velocities the path of travel that the liquid follows will vary and the amount of leakage past the baffles will change. This is illustrated in a general way in Fig. 1 which shows the most common or half-moon type of baffle. At low velocities (Fig. 1a) the fluid contains little kinetic energy and barely follows the baffles by the shortest path whereas at extremely high velocities it may squirt through a restricted opening and be reversed in direction of flow by impingement against the next baffle (Fig. 1c). Undoubtedly the common condition of flow in commercial exchangers is more similar to the medium velocity case of Fig. 1b, but it must be kept in mind that the path of Fig. 1a is always the situation if the space between baffles is great (few baffles), and the flow tends to be like Fig. 1b or 1c if the baffles are spaced very close together. Any void spaces tend to increase the velocity along the path of travel but this higher velocity is negated to some extent by the low velocity in the void spaces. In opposition leakage through the baffles tends to decrease the velocity along the path of travel and the effects of these two influences counteract each other so that over-all effect on the velocity is small or perhaps tends to lower values particularly in the case of heat transfer.

In addition to the paths of travel indicated in Fig. 1, the fluid takes a zig-zag path between the tubes. This adds to the length of travel by 15 to 30 per cent (one over the cosine of 30° or of 45°) for triangular and for square arrangements of tubes.

Length of Travel for Half-Moon Baffles

The following symbols are used:

L = length of exchanger, ft.
D = dia. of shell, ft.
h = crossflow, ft. (nearly equal to baffle height)
x = baffle spacing, ft.
V = velocity, ft./sec.

Low velocity or large x—

$$\text{travel} = \frac{L}{\cos A \cdot \cos B}$$

Cosine A has a value of about 0.75 (flow between tubes) and cosine B ranges downward in value from 1 to a value of .707 at about D equals x, and downward to a value of 0.15 for very close baffle spacings. Empirically the travel may be expressed as:

$$\text{travel} = L(1 + k)$$

which is convenient for comparison with other forms which follow. The value of k is somewhat related to D divided by x.

Medium velocity—

$$\text{travel} = L + \frac{L/x}{\cos A} h$$

Since h is usually equal to about 0.75 D and since cos A equals about 0.75

$$\text{travel} = L + L\frac{D}{x} = L\left(1 + \frac{D}{x}\right)$$

High velocity or close baffles—

For the maximum velocity of flow the travel might approach the following:

$$\text{travel} = 2L + L(1 + k) = L(3 + k)$$

Examination of Fig. 1 and the equations listed above indicates that an equation of the following general form enters into all of the situations and is particularly representative of commercial baffle spacings, tube spacings, etc.

$$\text{travel} = L\left(A + \frac{D}{x}\right)$$

in which the constant A ranges from 0.5 to 3, the largest values being for extremely high-velocity closely baffled exchangers. Several special cases are shown in Table 1.

TABLE 1—APPROXIMATE VALUE OF THE CONSTANT "A" IN CROSS-FLOW EXCHANGERS

	No baffles	At x = D	Many baffles
Low velocity	1.0	0.56	1.0
Regular velocity ...	1.0	1.0	1.3
High velocity	1.0	2.5	3.0

Time in Exchanger

The time in an exchanger is the free volume divided by the volume of the feedstock. The following new symbols are used:

N = number of tubes
S = space between tubes
G = gal. per hr. feed

$$N = .785\left(\frac{D}{d + s}\right)^2$$

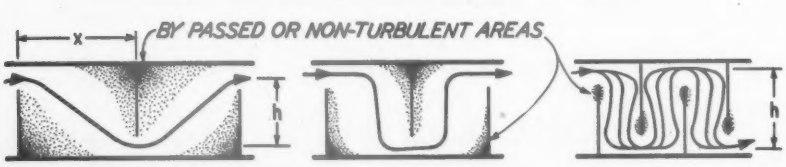
$$\text{Volume} = .785\,L(D^2 - Nd^2)$$

$$= .785\,L\left(D^2 - .785D^2\frac{d^2}{(d + s)^2}\right)$$

Tubes are spaced ¼ to ½ in. apart, the small tubes being spaced closer together than the large tubes, and thus:

$$\frac{d^2}{(d + s)^2} = .5$$

Fig. 1—Path of flow of fluid through the shell of single-pass bent exchangers containing half-moon cross baffles



(a) At low velocity or at wide baffle spacing

(b) At medium velocity and common spacings

(c) At high velocity or very close baffle spacing

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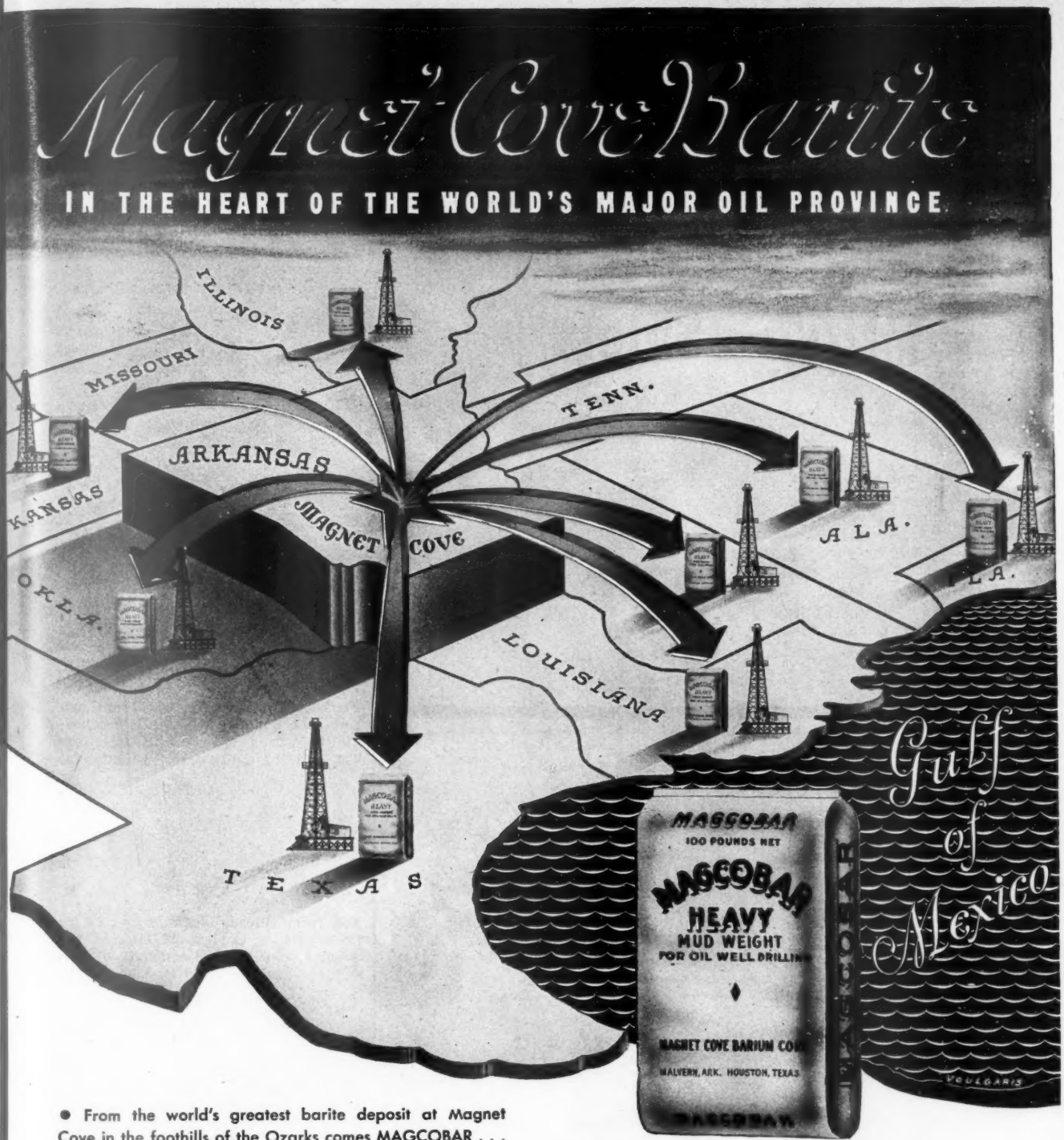

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$$D^2 - Nd^2 = (1 - .785 \times .5)D^2$$

$$= .61D^2$$

$$\text{Volume} = .785 \times .61\ LD^2$$

$$\text{Feed} = \frac{G}{7.48 \times 3{,}600}$$

$$\text{Time} = \frac{.785 \times .61\ LD^2}{\dfrac{G}{7.48 \times 3{,}600}}$$

$$= 13{,}000\ \frac{LD^2}{G}$$

Velocity

Velocity may be computed by dividing the travel by the time—

$$V = \frac{L\left(A + \dfrac{D}{x}\right)}{13{,}000\ \dfrac{LD^2}{G}}$$

$$= \frac{G\left(A + \dfrac{D}{x}\right)}{13{,}000\ D^2}$$

For the special and common construction where x is equal to D, the normal velocities of .75 to 1.5 ft./sec. (see Table 1), the approximate situation is:

$$V = \frac{2G}{13{,}000\ D^2}$$

$$= \frac{G}{6{,}500\ D^2}$$

For very close baffle spacings (x equals ½ or less of D) and for normal velocities the constant will be smaller, perhaps 3,000 to 5,000:

$$V = \frac{G}{4{,}000\ D^2}$$

These formulations generally give higher velocities than most of the methods proposed in the literature. Several derivations in the literature are based on the velocity at the row of tubes that lie across the diameter of the shell. Such a velocity is generally lower than the values shown here, being about one third at wide spacings, about half when D equals x, and about equal to the values shown here at very close baffle spacings.

John R. Suman, vice president of Standard Oil Co. (New Jersey) has been appointed one of seven directors of the National Association of Manufacturers.

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United Solves Difficult Problems in Red River Suspension Bridge

by Neil Williams

THE Red River crossing on United Gas Pipe Line Co.'s 24-in. gas pipe line recently placed in operation from the Carthage field, eastern Texas, to the Monroe area, northeastern Louisiana, is by means of a suspension bridge. The structure, located at East Point, 27 miles below Shreveport, not only is believed to be the largest of its kind in the world, but its erection called for unusual engineering design and construction skill.

Decision to build a suspension bridge rather than lay the line in the bed of the river was dictated by several conditions. At the place of crossing, the bed of the river consists of treacherous quicksand and the channel is continuously shifting with every period of high water, washing out banks and cutting new courses. Not only would laying of the line have been extremely difficult but maintenance of such a crossing always would have been endangered.

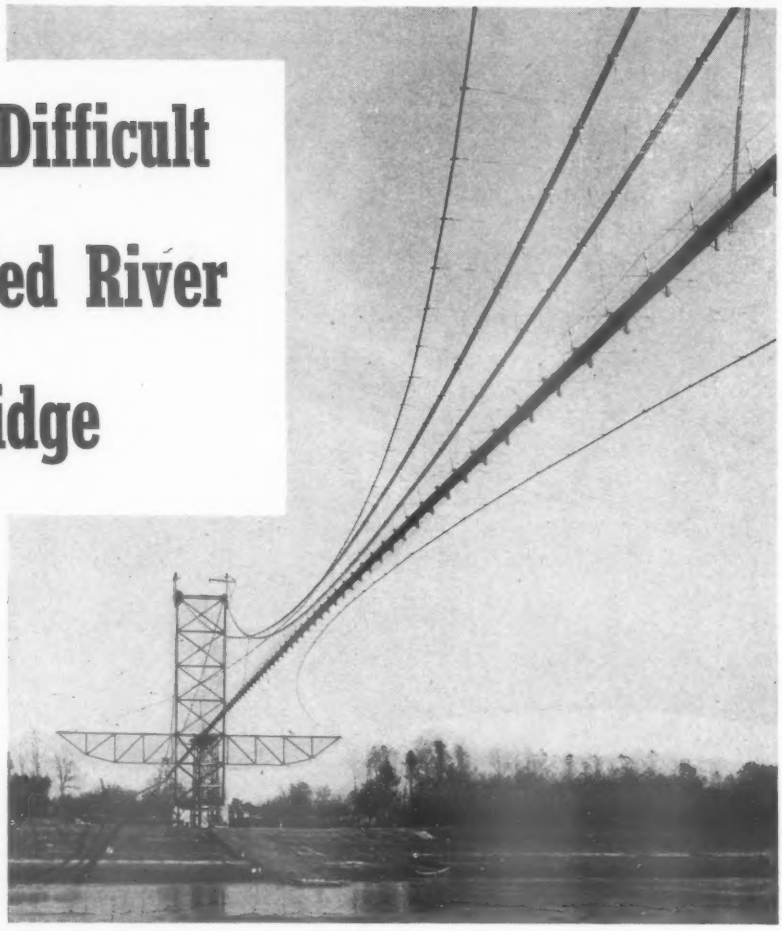


Fig. 1—United Gas Pipe Line Co.'s Red River suspension bridge showing section of river span and one of main steel towers with wind arms

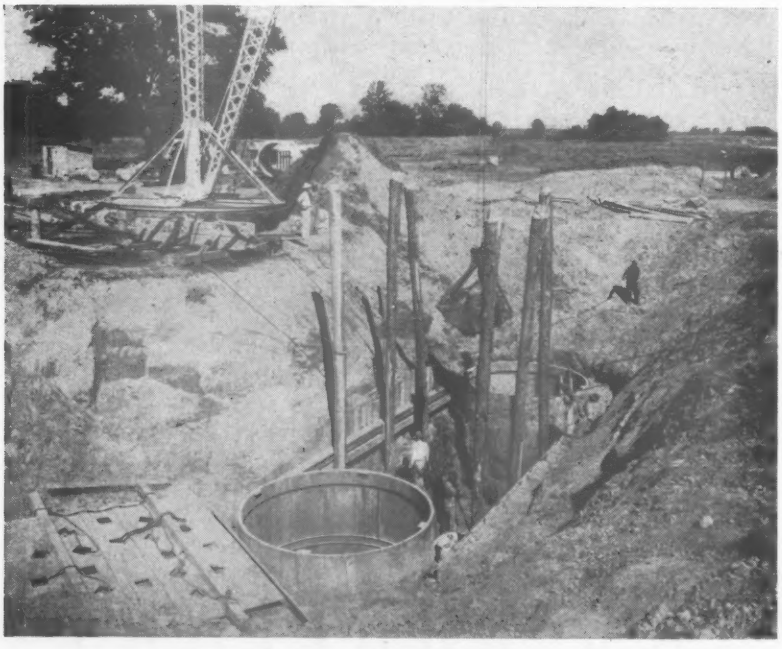
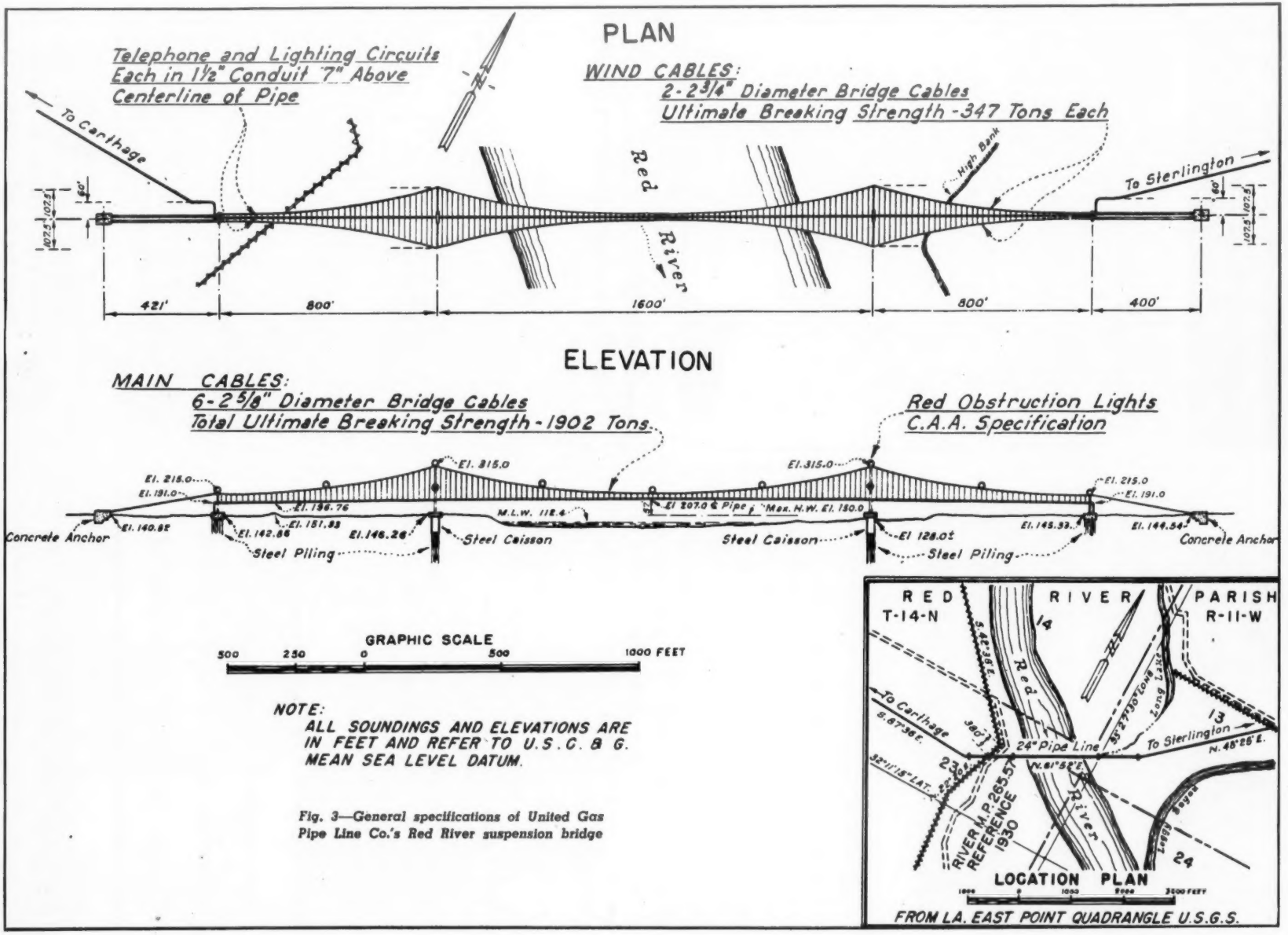


Fig. 2—Setting of twin caissons for main pier foundation

The same conditions, however, coupled with the exceptional length and size of the bridge required and the unusual load to be carried, presented various problems in structural design, particularly with respect to provision of adequate footings and foundations for its support. Not only is the river comparatively wide at this point, calling for a long main span, but it is designated as a navigable stream, which had to be taken into consideration in meeting government regulations as to minimum elevation.

General specifications of the bridge are indicated in the accompanying drawing (Fig. 3), showing plan and elevation views of the structure. Length of central span between the main piers is 1,600 ft., which with an 800-ft. approach span on each side of the river makes the over-all length of the bridge 3,200 ft. Meeting government regulations as to elevation, the bottom of the 24-in. pipe is sus-



NOTE:
ALL SOUNDINGS AND ELEVATIONS ARE IN FEET AND REFER TO U.S.C. & G. MEAN SEA LEVEL DATUM.

Fig. 3—General specifications of United Gas Pipe Line Co.'s Red River suspension bridge

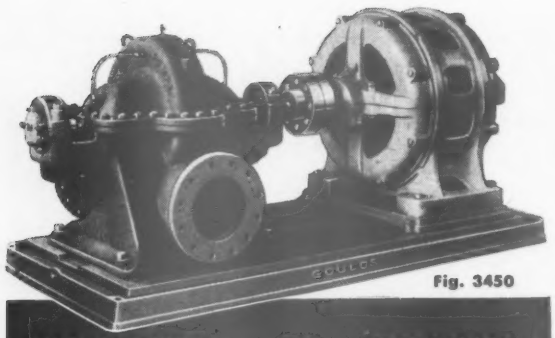


Fig. 3450

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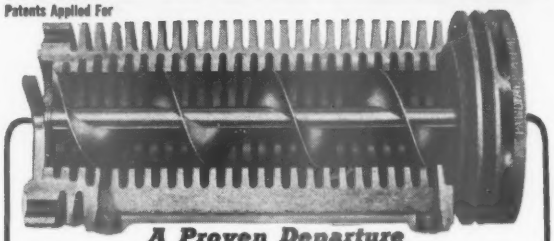

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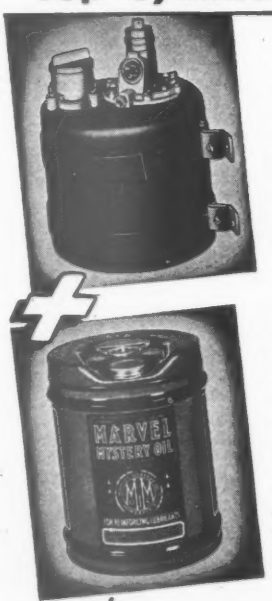

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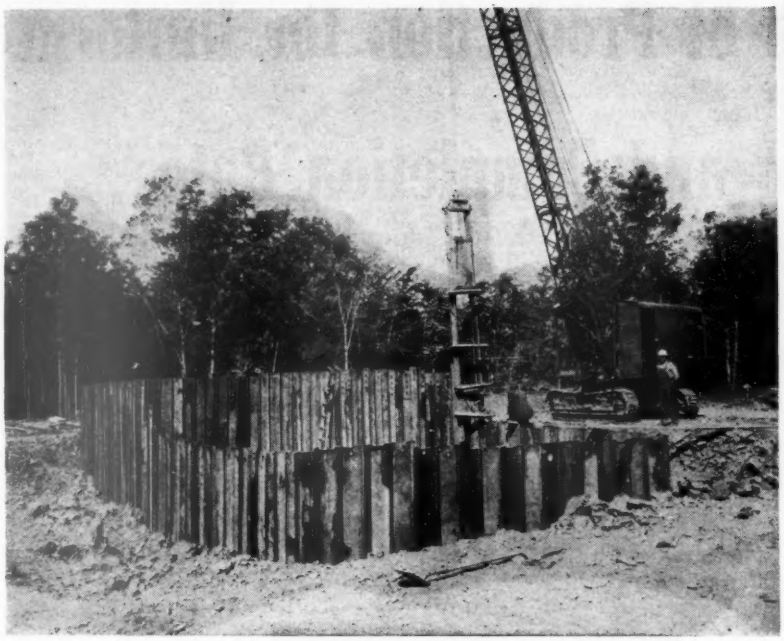

Fig. 4—Driving of steel sheeting for concrete anchor forms

pended 56 ft. above maximum high-water level, placing it 93½ ft. above mean low water level.

Tops of the two main steel towers supporting the six 2⅝-in. main bridge cables are 168.8 ft. above ground level on the west side and 187 ft. above ground level on the east side. These elevations place them 163 ft. above the tops of the respective main piers and 109 ft. above the bottom line of the suspended 24-in. pipe. The above cables are 4,020 ft. long each and have a total ultimate breaking strength of 1,902 tons. Each, together with connecting sockets, weighs approximately 2 tons.

Wind arms on the main towers extend 107 ft. on each side from the center lines. Weighing approximately 18 tons, each was assembled on the ground and then lifted into place, after the towers were erected. The two wind cables are 2¾ in. in diameter and 4,020 ft. long. Each weighs 26 tons and has an ultimate breaking strength of 347 tons.

Tops of the rest towers on the end piers are 72.14 ft. above ground level on the west side and 69.67 ft. above ground level on the east side. They are 24 ft. above the bottom line of the 24-in. pipe which, in turn, is 48.14 ft. above ground level at the west end pier and 45.17 ft. above ground level at the east end pier.

Foundation for each of the two main piers was formed by twin 50-ft. caissons spaced 36 ft. center to center and excavated to bottom (Fig. 2). Inside each of these eleven 60-ft. H-beam piles were driven into shale to an elevation of 53 ft. Eight-foot concrete seals were poured around the tops of these in the caissons and around the footings of the caissons. After the seals had set, the caissons were filled with cement, and a reinforced-concrete cap poured. Top of the pier on the west bank is 5.74 ft. above ground level, while that on the east bank is 24 ft. above ground level. Rest piers consists of reinforced concrete blocks each based on 95-ft. piles, driven into the shale bed.

Concrete anchor blocks, located approxmately 400 ft. back of the rest piers at each end of the bridge, were formed in 25-ft. excavations. Around the walls of the excavations, each approximately 58 ft. long and 22 ft. wide, 40-ft. lengths of 15-in. wide interlocking steel sheeting were driven to grade (Fig. 4). The forms then were braced on the interior with H-beams and filled with cement. The sheeting walls were left in place to insure additional anchor support and to protect the concrete.

All bridge towers are equipped with aircraft warning lights. Lighting and telephone circuits are carried in 1½-in. conduit strung 7 in. above the centerline of the pipe. The bridge was constructed by Pittsburgh-Des Moines Steel Co.

R. W. Randle, head of motor transport activities of The Texas Co., has been elected president of the Petroleum Motor Transport Association of Oklahoma. **C. J. Martin,** Phillips Petroleum Co., was chosen first vice president; **J. W. Green,** Olson Drilling Co., second vice president; **J. L. Avery,** Adkins Oil Co., secretary-treasurer. **Omar Fincannon,** Helmerich & Payne, Inc., and **R. C. Hopper,** Skelly Oil Co., were elected directors.

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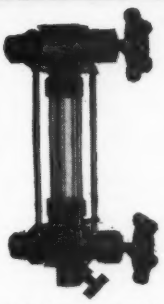

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THE POSITIVE LEAK PREVENTER

Optimum Rate of Production for Uniform Producing and Completion Rates

*by Park J. Jones**

PART 23 OF A SERIES

THE optimum rate of production is slower for uniform rates of production than for declining rates of production. If a fraction of a reserve is recoverable at uniform rates of production and a fraction at declining rates of production, the optimum rate of production is some value between the optima for uniform and declining producing rates. The optimum rate of production also varies with the rate of production decline. This article is limited to declining rates of production for uniform rates of depletion. A procedure is illustrated for estimating the optimum rate of production for any combination of fractional reserves recoverable at uniform rates of production and depletion.

Limiting Optimum Rates of Production

CONSIDER a reserve which is recoverable either at uniform rates of production or at uniform rates of depletion. For these conditions, the curves of Fig. 23-1 give the optimum rate of production. The Q curve shows optimum rates of production in per cent per year for uniform rates of production. The R curve shows the initial optimum rate of production for uniform rates of depletion. Optimum rates are plotted against the product X (1 — B) or X (1 — E) where B is a uniform operating outgo and E is an average operating outgo equivalent to increasing operating outgoes which accompany declining rates of production.

Consider a reserve of which a fraction "a" is recoverable before production starts declining and a fraction (1 — a) is recoverable at uniform rates of depletion. Evidently, the optimum rate of production is some value between those illustrated in Fig. 23-1.

*Production consultant, Houston.

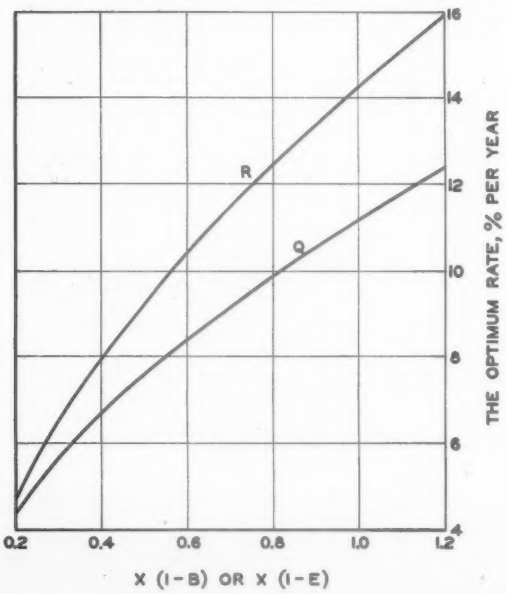


Fig. 23-1—The optimum rate of production for uniform rates of production Q and depletion R vs. the product X (1 — B) or X (1 — E); X is the ratio of per well annual producing rate to per well investment in M.c.f.'s/M.c.f., or barrels per barrel; (1 — B) or (1 — E) is the income after operating outgo in M.c.f.'s per M.c.f., or barrels per barrel, of gross; interest is 3 per cent

Statement of Producing Conditions

Denote an invariant initial reserve by unity. Let a fraction "a" of this reserve be recoverable before production starts declining. Let Q equal the rate of production at the time producing rate starts declining. The number of years y that would be required to recover the reserve "a" at a uniform rate of production Q is defined by:

$$y = \frac{a}{Q} \qquad (1)$$

where "a" is in M.c.f.'s per M.c.f., or barrels per barrel, of an initial reserve and Q is in M.c.f.'s per M.c.f., or barrels per barrel, per year of an initial reserve.

At the time production starts declining, the reserve producible at declining rates is equal to (1 — a). The rate of depletion at this time, and at any later time for uniform rates of depletion, is given by:

$$R = \frac{a}{y\,(1-a)} = \frac{Q}{1-a} \qquad (2)$$

The Economic Balance

Let B equal the sum of taxes, royalty, and operating expenses for uniform rates of production. Then (1 — B) is the income per unit of gross production. Let X be the ratio of annual per well producing capacity at the time production starts declining to per well investment including per well plant investment. Then the present value P of the reserve recoverable at a uniform rate of production Q is defined by:

$$P = \frac{Q}{i}\,(1 - e^{-iy})\,(1 - B) - \frac{Q}{X} \qquad (3)$$

But, if only a fraction "a" of an initial reserve is recoverable at the uniform rate Q, the time y is equal to a/Q. Hence, the present value P for the reserve "a" is defined by:

$$P = \frac{Q}{i}\,(1 - e^{-ia/Q})\,(1 - B) - \frac{Q}{X} \qquad (4)$$

At the end of y years production starts declining and a reserve equal to (1 — a) is to be recovered at uniform rates of depletion.

The present value of a reserve producible at uniform rates of depletion cannot exceed the present value P_n defined by:

$$P_n = \frac{R}{R + i}$$

where R is a uniform rate of depletion; i is interest rate; and P_n refers to 100 per cent of a given reserve. As the reserve here under consideration is only (1 — a) times an initial reserve, we have:

$$P_n = \frac{R(1-a)}{R + i}$$

Upon substituting Q/(1 — a) from Equation 2 for R in the foregoing expression, we obtain:

$$P_n = \frac{Q(1-a)}{Q + i(1-a)} \qquad (5)$$

Equation 5 defines the present value of the reserve (1 — a) relative to the time production starts declining and before operating outgo.

Declining rates of production are commonly accompanied by increasing operating expenses. However, an increasing operating outgo may be replaced by a uniform outgo which is equivalent to an increasing operating outgo. Let E equal the equivalent operating burden for the reserve (1 — a). Then (1 — E) is the equivalent income in M.c.f.'s per M.c.f., or barrels per barrel, of gross production. Hence, the present value P_n after operating outgo is given by:

$$P_n = \frac{Q(1-a)}{Q + i(1-a)}(1 - E) \qquad (6)$$

Equation 6 defines the present value of the reserve (1 — a) after operating outgo relative to the time production starts declining. This present value has to be discounted for the time interval during which the reserve "a" is accumulated. The time interval is a/Q and the present worth factor is $e^{-ia/Q}$. Accordingly:

$$P_n = \frac{Q(1-a)}{Q + i(1-a)}(1 - E)\, e^{-ia/Q} \qquad (7)$$

Upon adding the present value defined by Equation 7 to that given by Equation 4, we obtain:

$$P = \frac{Q}{i}(1 - e^{-ia/Q})(1 - B) - \frac{Q}{X} + \frac{Q(1-a)}{Q + i(1-a)}(1 - E)\, e^{-ia/Q} \qquad (8)$$

The right side of Equition 8 contains three quantities. The middle quantity, Q/X, represents the investment required to provide the producing Q. The first quantity gives the present value of the reserve "a" which is recoverable before producing rates decline below Q. The last quantity gives the present value of the reserve (1 — a) which is recoverable at a uniform rate of depletion equal to Q/(1 — a).

Optimum Rate of Production

The optimum rate of production is that rate for which the present value defined by Equation 8 is a maximum. The optimum rate may be obtained by differentiating present value with respect to producing rates and equating the result to zero.

For example, if 100 per cent of an initial reserve were recoverable at uniform rates, the last quantity in Equation 8 would vanish and the optimum rate of production would be the rate defined by:

$$\frac{Q + i}{Qe^{i/Q}} = 1 - \frac{i}{X(1-B)} \qquad (9)$$

where Q is now the optimum rate of production and is illustrated by the Q curve in Fig. 23-1.

On the other hand, if 100 per cent of an initial reserve were recoverable at uniform rates of depletion, the first quantity in Equation 8 would vanish and the optimum rate of production would be the rate defined by:

$$R = [iX(1 - E)]^{1/2} - i \qquad (10)$$

where R is now the optimum initial rate of production and is illustrated by the R curve in Fig. 23-1.

For values of "a" other than one or zero, the optimum rate of production is defined by the expression in the appendix to this article. In order to apply this expression it is necessary to estimate (1) the fraction of the reserve recoverable before production starts declining, (2) the operating outgo for uniform rates of production, (3) the average per well producing capacity at the time production starts declining, and (4) the equivalent operating outgo for the reserve recoverable at declining rates of production. Finally, the expression is for uniform rates of depletion only. In the light of these considerations, we suggest that an approximate method may be used in lieu of the exact procedure.

We suggest that the approximate optimum rate of production defined by:

$$Q_o = Qa + R(1 - a) \qquad (11)$$

is accurate enough for practical purposes. Equation 11 states that the optimum rate of production Q_o is equal to the sum of two factors. The first factor, Qa, is the optimum rate of production Q for uniform rates of production multiplied by the reserve "a" recoverable at uniform rates of production. The second factor, R(1 — a), is the optimum initial rate of production R for uniform rates of depletion multiplied by the reserve (1 — a) recoverable a uniform rates of depletion.

Natural-Gas Reservoirs

Fifty per cent of a trillion-cubic-foot natural-gas reserve is recoverable at uniform rates of production and 50 per cent at uniform rates of depletion. Estimate the optimum conditions if (1) the per well investment is 2 billion cubic feet, (2) the per well producing capacity averages 8 million cubic feet per day at the time producing rates start declining, (3) the peak demand during winter months is 20 per cent above the annual average demand, (4) burden on production is 35 per cent of gross for the first 500 billion feet and the equivalent operating outgo is 50 per cent of gross for the second 500 billion feet, and (5) the reserve can be financed at a cost of 3 per cent.

In this example, the ratio X of per well annual producing capacity, relative to peak demand at the time production starts declining, to the per well investment is defined by:

$$X = 8(365)/1.2(2) = 1.217$$

The product X(1 — B) for the first 50 per cent of the reserve is given by:

$$X(1 - B) = 1.217(1 - 0.35) = 0.791$$

From the Q curve in Fig. 23-1, the optimum rate of production corresponding to 0.791 is 9.9 per cent per year of the trillion-cubic-foot reserve. The product X(1 — E) for the second 50 per cent of the reserve is given by:

$$X(1 - E) = 1.217(1 - 0.5) = 0.608$$

From the R curve in Fig. 23-1, the optimum rate of production corresponding to 0.608 is 10.5 per cent per year of the trillion-cubic-foot reserve.

By Equation 11, the approximate optimum rate of production is as follows:

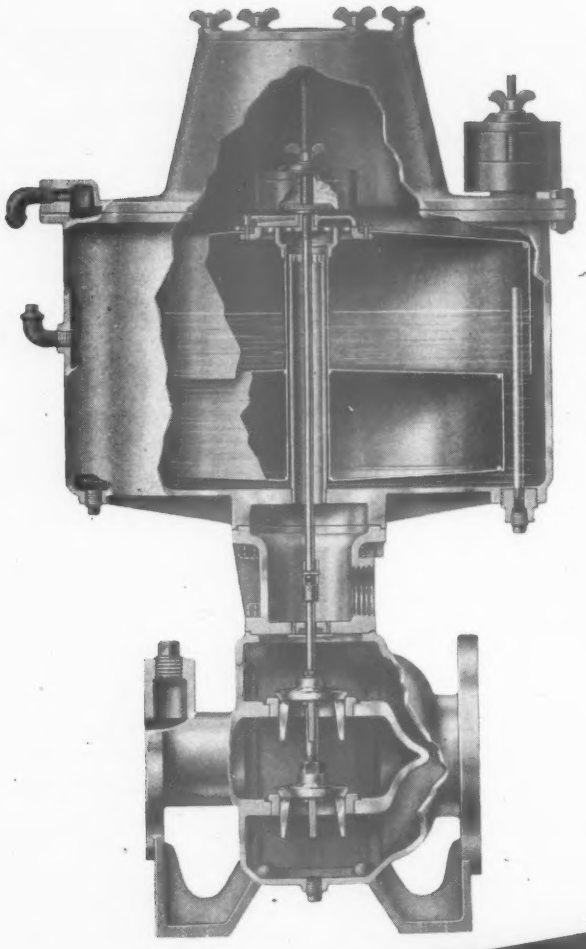
$$Q_o = 0.5(9.9) + 0.5(10.5) = 10.2 \text{ per cent per year}$$

The optimum conditions may be itemized as follows:

Optimum rate of production, billion per year	102
Optimum rate of production, million per day	280
Optimum number of wells	42
Optimum investment, billion feet	84
Optimum investment, per cent of reserve	8.4

Oil Production at Uniform or Slowly Declining Pressures

Sixty per cent of a 100-million-barrel oil reserve is recoverable at uniform rates of production and 40 per cent at uniform rates of depletion. Estimate the optimum conditions if (1) the per well investment averages 50,000 bbl., (2) the per well producing capacity at the time production starts declining is 100 bbl. per day,



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(3) the MER, or maximum efficient rate, is higher than the optimum rate, (4) the burden on production is 35 per cent of gross for the first 60 per cent of reserve, (5) the equivalent operating outgo is 50 per cent of gross for the remaining 40 per cent of the initial reserve, and (6) the reserve can be financed at a cost of 3 per cent.

In this example, the ratio X of per well annual producing capacity at the time production starts declining to the per well investment is defined by:

$$X = 100\,(365)/50{,}000 = 0.73$$

The product $X\,(1 - B)$ for the first 60 per cent of the reserve is given by:

$$X\,(1 - B) = 0.73\,(1 - 0.35) = 0.474$$

From the Q curve in Fig. 23-1, the optimum rate of production corresponding to 0.474 is 7.3 per cent of the 100-million-barrel reserve. The product $X\,(1 - E)$ for the remaining 40 per cent of the reserve is given by:

$$X\,(1 - E) = 0.73\,(1 - 0.5) = 0.365$$

From the R curve in Fig. 23-1, the optimum rate of production corresponding to 0.365 is 7.3 per cent of the 100-million-barrel reserve.

By Equation 14, the approximate optimum rate of production is also 7.3 per cent. The optimum conditions for this example may be itemized as follows:

Optimum rate of production, million barrels per year	7.30
Optimum rate of production, barrels per day	20,000
Optimum number of wells	200
Optimum investment, million barrels of oil	10.00
Optimum investment, per cent of reserve	10

The foregoing optimum conditions are relative to a MER which is equal to, or is higher than, 20,000 bbl. per day during the first 60/7.3, 8.25 years in the life of the 100-million-barrel reserve at 20,000 bbl. per day. If the MER at any time during the first 8 years were less than 20,000 bbl. per day, the curves in Fig. 23-1 would not apply.

Appendix to Article 23

It can be verified, by differentiating Equation 8 with respect to producing rate and equating the result to zero, that the optimum rate of production is defined by:

$$\frac{1}{i}\left(1 - \frac{Q + ia}{Q}\,e^{-ia/Q}\right)(1 - B) - \frac{1}{X} + \frac{i(Q + a - ia^2)e^{-ia/Q}}{Q[Q + i(1 - a)]^2}\,(1 - a)\,(1 - E) = 0$$

in which Q is the optimum rate of production.

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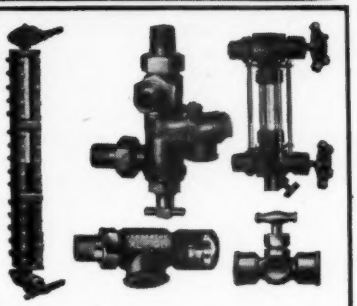

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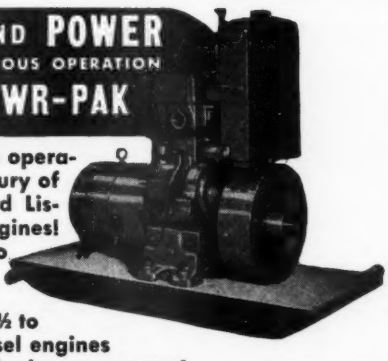

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WOOD RIVER OIL AND REFINING COMPANY, INC.

High Recovery in Lake Creek Operations

(Continued from page 51)

necessary only as a precautionary measure.

These lines, comprising both the 2,000 and 5,000-psi. systems, are completely insulated with standard-thickness materials to insure heat conservation while being impervious to moisture. This maintains very constant and uniform temperatures with a minimum of expansion and contraction of the lines as well as preventing the formation of hydrates during the cooler weather. Since some portions of the lines are frequently submerged by flash floods, insulation in lines traversing these particular areas is made completely waterproof.

Automatic gas-fired heaters are provided only where necessary at producing wells or any critical points or junctions on the gathering system, operating only during the extreme cooler weather.

Thermostatically controlled water-submerged aftercoolers on the gas-injection system as the gas leaves the compressors, control the temperature of that gas returning from the plant to the injection wells until it reaches the particular wellhead, eliminating hydrates and reducing the hazard through the excessive expansion or contraction of the well casings.

3. Automatic Booster Compressors

Inasmuch as the early design and construction of the Lake Creek cycling plant was actually commenced prior to the outlining of the productive area—prompted by the urgent need and demand for products necessary to the requirements for war, an uncertain amount of trial-and-error operating was necessary before determining with assurance the proper and most efficient pressures necessary to inject gas into the different sands of which there were several of varying porosity and permeability. Selecting 4,100 psi. as the common injection pressure which proved effective, provisions were then made to deliver to any well or sand any portion of this gas at a pressure through the boosting to a maximum of 5,000 psi. if necessary. After approximately a year of field observation, it was determined that a pressure of approximately 5,000 psi. would materially increase the volume to be injected to certain chosen sand or wells providing for more correct distribution in the sands. After a thorough study of the various sands and wells, a site common and centrally located to those starved sands was provided with two booster engines of 225 hp. each, boosting approximately 65 per cent of the gas from 3,900-4,100 psi. to 4,900 psi.

4. Speed and Pressure Governors

Pilot-controlled governors control the speed of the compressor engine to maintain constant operating conditions in both the booster station and the central plant station. These governors function so as to increase the speed of the booster plant engines when the pressure rises on the 4,100-psi. suction line, and also to decrease speed of engines in the plant when pressure declines below 4,100 psi., the main plant taking suction at 1,500 psi. from absorbers and discharging at 4,100 psi.

One of the most valuable automatic devices used in connection with this plant is a recording temperature shutdown device on the packing gland of each high-pressure compressor cylinder. This device automatically shuts the unit down when any condition causes the packing to heat above normal operating temperature.

5. Simplicity and Streamlining of Plant

The Lake Creek plant was laid out in more or less a streamlined fashion, the first grouping consisting of plant auxiliaries such as the shop, laboratory, office, warehouse, change room, ice plant, boiler and electric generating plant, all being located in an area directly west of the plant proper. Plant-cooling facilities and circulating pump houses are located

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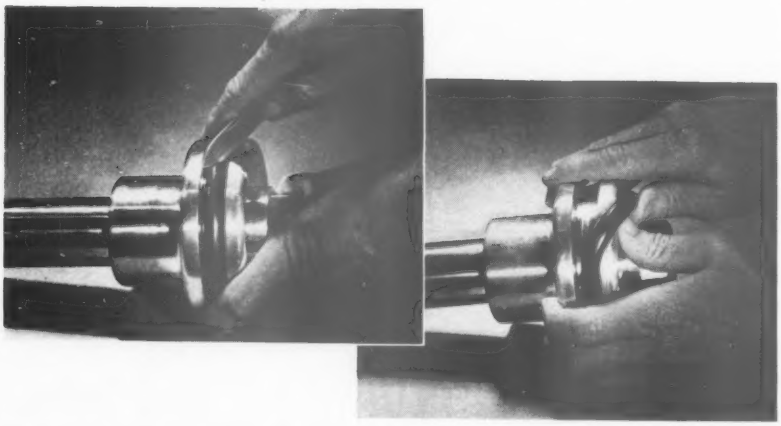

● Just cut off the old packing and slip a new one into place. It's quick and easy and a knife is the only tool required.

But ease of changing packing is only one of the good features of Maloney pistons. *Longer Packing Life* means you don't have to do even this easy job so often.

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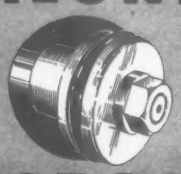

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BOILER FEED WATER • SALT WATER • GASOLINE • KEROSENE • PROPANE • SWEET OR SOUR CRUDE or any refinery liquid, so long as the temperature does not exceed 250° F.

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Industry has yet to discover a better metal protective paint than Red Lead. This is due to inherent fundamental properties of the pigment itself.

Among the most important of these are Red Lead's definite chemical composition and its purity, as distinguished from pigments that have indefinite composition or vary from batch to batch, with resulting possibility of variation in performance.

The reason for this uniformity is that red lead is a simple chemical compound—a combination of only two elements, oxygen and high-purity metallic lead. It is also an extremely pure compound, containing no corrosion accelerating impurities such as water-soluble chlorides or sulfates.

Uniform performance means predictable chemical behavior—dependable performance as a rust-inhibitive paint, day after day, job after job.

Furthermore Red Lead has the property of controlling acid conditions recognized as accelerators of rust. In the presence of various acids, Red Lead forms insoluble lead salts, at the approximate rate at which the acids are supplied. This is true whether the acids originate from acid forming environments, such as gas, smoke, and moisture in the atmosphere, or from the oxidation of the paint vehicle.

Remember, too, that Red Lead is compatible with practically all vehicles commonly used in metal protective paints, including all the fast drying resins.

Specify RED LEAD
for All Metal Protective Paints

The value of Red Lead as a rust preventive is most fully realized in a paint where it is the only pigment used. However, its rust-resistant properties are so pronounced that it also improves any multiple pigment paint. No matter what price you pay, you'll get a better paint for surface protection of metal if it contains Red Lead.

***These spectograms** show the high degree of uniformity and purity of nine different batches of Red Lead. Each spectrum is a practical duplicate of every other. Such uniformity is an important reason for Red Lead's outstanding performance.*

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Write for New Booklet — *"Red Lead in Corrosion Resistant Paints"* is an up-to-date, authoritative guide for those responsible for specifying and formulating paint for structural iron and steel. It describes in detail the scientific reasons why Red Lead gives superior protection. It also includes typical specification formulas. If you haven't received your copy, address nearest branch listed below.

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The benefit of our extensive experience with metal protective paints for both underwater and atmospheric use is available through our technical staff.

NATIONAL LEAD COMPANY: New York 6, Buffalo 3, Chicago 80, Cincinnati 3, Cleveland 13, St. Louis 1, San Francisco 10, Boston 6 (National Lead Co. of Mass.); Philadelphia 7 (John T. Lewis & Bros. Co.); Pittsburgh 30 (National Lead Co. of Pa.); Charleston 25, W. Va. (Evans Lead Division).

Dutch Boy Red Lead

to the north side of the actual process portion of the plant. Directly to the east of the boiler plant, etc., and south of the cooling towers with ample room for expansion, are the compressor facilities and their related auxiliaries. Continuing east is the process pump house with all absorption and distillation equipment arranged in a straight alignment on the north side of the pump house, according to the priority of the operation. Likewise, the fractionation units have been similarly arranged on the south side of the pump house, with the control room for distillation and fractionation to the east of the pump house. The storage and blending facilities, the last operation in the process, together with shipping pumps, are located directly in an area to the east of the plant proper.

Vapor-Recovery System

Another interesting feature embodied in the Lake Creek operation is the extensive vapor-recovery system which has been installed in the interest of conservation of petroleum products. All tank cars and tank trucks are loaded under slight pressure. Venting gas vapors are collected and returned to the plant for reprocessing—such recovery can readily approximate 1 per cent of the production.

Plant Process

Raw material (which includes all formation gas and distillate) from the wells is brought into the plant through one of three gathering systems which operate respectively at 300, 800, and 1,500 psi. according to the ability of the individual well to flow. Gas from the 300 and 800-psi. gathering system enters flash tanks collecting the liquid which is then passed on to a 185-psi. flash tank. The wet gas from these two lower pressure systems released from the flash tanks is then compressed and discharged into the 1,500-psi. gathering system, which passes through an atmospheric precooler and if necessary, immediately to a propane chiller where it is cooled to 85° F., passing through 1,500-psi. separators from where the gas is delivered to the high-pressure absorbers with the resulting liquid from this 1,500-psi. flash tank passes to three pressure step-down flash tanks.

Consider the four main streams of the process through the plant in the following order: (1) Stabilization of liquid from separators, (2) absorption of liquids in the gas and stripping of adsorption oil, (3) fractionation of liquids into pure products, (4) cycling of dry gas.

1. Stabilization of liquid from separators.—Liquid stream from 1,500 lb. and lower separators to the distillate fractionator is as follows:

From 1,500-psi. separator to 750-psi. flash tank—gas taken overhead to high-pressure reabsorber.

From 750-psi. flash tank to 450-psi. flash tank—gas overhead to high-pressure reabsorber.

From 450-psi. flash tank to 185-psi. flash tank—liquid from 300 and 800-psi. gathering system also enters 185-psi. flash tank. Gas overhead passes to the low-pressure reabsorber. Entrained water is separated from the petroleum liquids.

From 185-psi. flash tank to 140-psi. flash tank—liquid passes through water filters for further dehydration before entering 140-psi. flash tank elevated to furnish flooded pump suction. Gas overhead to low-pressure reabsorber.

From 140-psi. flash tank to heat exchanger to fired heater—liquid temperature raised to 410° F.

From fired heater to distillate fractionator—gasoline and lighter hydrocarbons are taken overhead from the distillate fractionator; are partially condensed for reflux with the excess liquid fed to the gasoline fractionator. The uncondensed vapors from the primary condenser then pass through the secondary atmospheric condenser and propane chillers where total condensation is achieved, then on to the deethanizer charge tanks.

A side cut is withdrawn from the seventh tray of this distillate fractionator for absorption oil makeup. This side-cut stream is flashed to the low-pressure still where gasoline and lighter hydrocarbons are removed overhead. A kerosene stripper fed

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WICO makes many other models of magnetos which are designed specifically for the rigorous service demanded of accessories by the oil industry. WICO magnetos are supplied as original equipment and are available through the many Authorized WICO Service Stations conveniently located in all oil producing centers. Wico Electric Company, West Springfield, Massachusetts.

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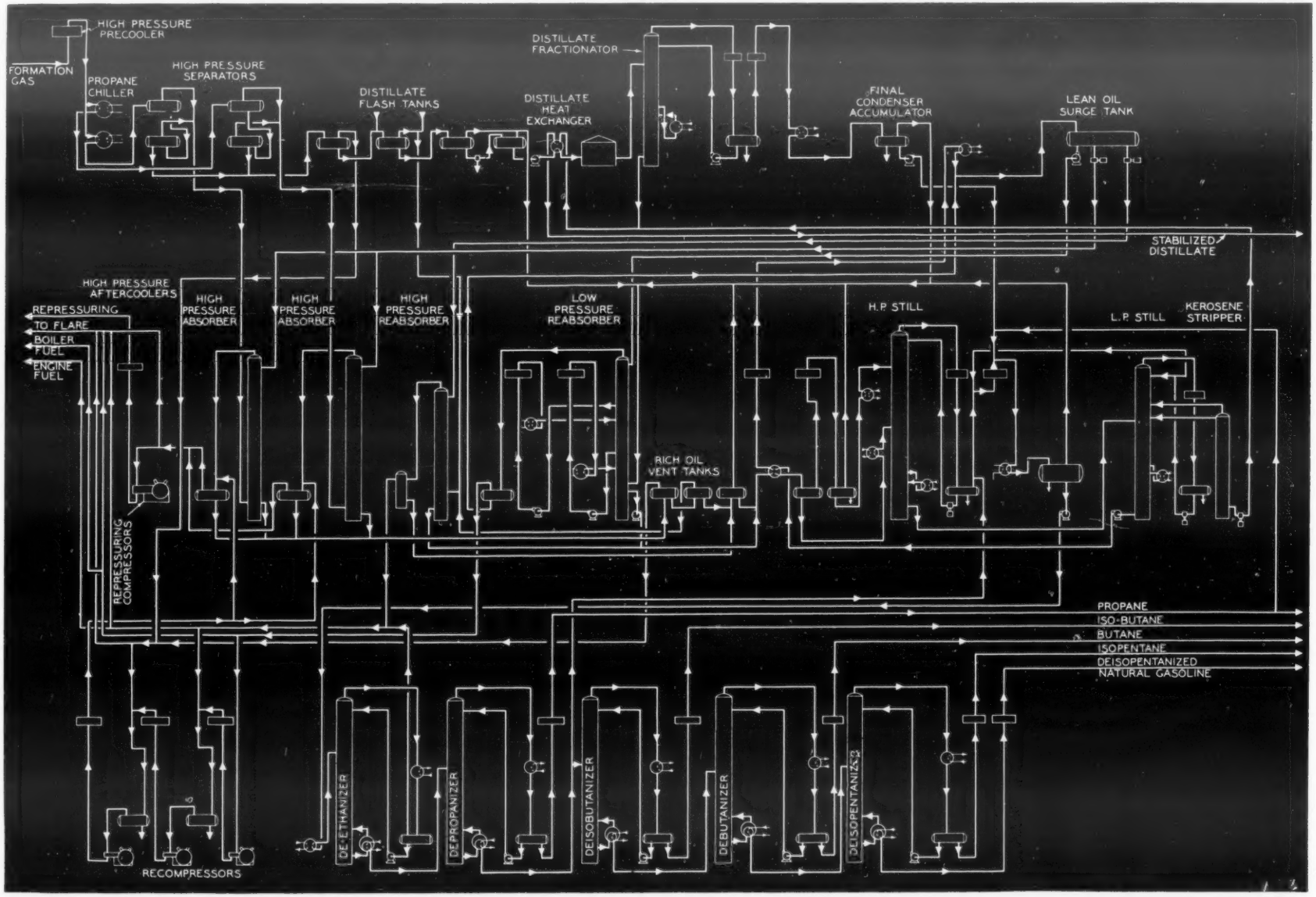

Flow diagram of Superior Oil Co.'s Lake Creek unit

Cycling at Lake Creek

The 4-CYCLE V-ANGLE Line

At the Lake Creek, Texas, Cycling Plant of The Superior Oil Company, you will find the six KVG gas-engine-driven compressors shown above. Five of these 800-hp units, operating single-stage, compress the gas from 1500 to 4100 psi; the other, a three-stage compressor, operates at 1500 psi discharge.

Serving this same installation are three XVG compressors...a 300-hp refrigeration compressor and two 225-hp boosters. An additional 300-hp booster is now being installed. Electric power is furnished by three 250-kw Type PVG gas-engine-generators.

All of these are modern 4-cycle, V-angle units... bringing the total at Lake Creek to 6960 horsepower. The Superior Oil Company was among the first to install Ingersoll-Rand 4-cycle, V-angle units, and has a number of these machines in its various operations.

For dependability and economy...for ability to handle surging, variable, or steady loads and pressures...and for simplicity...*specify 4-cycle, V-angle.* Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.

Ingersoll-Rand

6-828

from the fourteenth tray of the low-pressure still controls the initial boiling point of the absorption oil.

A final bottom product of approximately 40° A.P.I. is removed from the distillate fractionator to distillate storage.

The gasoline fractionator which is fed with excess liquid from the primary reflux condensers of the distillate fractionator, is used to separate in the feed stock the hexanes and heavier from the pentanes and lighter, thereby relieving the other fractionating equipment of a portion of its load. Resultant products are hexanes and heavier taken from the bottom of this column to gasoline storage, and pentanes and lighter removed overhead, condensed, and then fed to the deethanizer storage tank.

2. Absorption of liquid from the gas and stripping of absorption oil.—Absorption oil, after being enriched in the absorbers, is passed through the following sequence of flashes, heating and distillation:

From 1,500-psi. absorbers, No. 1 and No. 2, to 780-psi. flash tank—vapors to high-pressure reabsorber.

From 780 psi. to 450 psi.—vapors to high-pressure reabsorber.

From 400 psi. to 215 psi.—vapors to low-pressure reabsorber.

From 215 psi. to heat exchanger and vent and preheater to high-pressure still—heated to 390° F.

From high-pressure reabsorber to heat exchanger to high-pressure still—vapors overhead condensed, then to C_3 chiller to stabilizer charge tank. Side stream taken from low-pressure still to oil purifier for removal of heavy material in the oil.

From low-pressure still, pumped through exchanger, coolers, and propane chiller to lean-oil surge tank—oil makeup enters low-pressure still. Vapors overhead condensed and excess reflux pumped to stabilizer charge tank.

From lean-oil surge tank, pumped to absorbers—cycle completed.

3. Fractionation of liquid into pure products. — Fractionation is accomplished with five columns. With the exception of the first and last columns, each receives its feed from the bottom of the preceding column with the overhead product being run to storage. Flow arrangement follows:

From deethanizer charge tanks to preheater to deethanizer—ethane and lighter overhead to fuel.

From deethanizer to depropanizer—propane taken overhead through condenser to storage.

From deisobutanizer to debutanizer—n-butane overhead through condenser to storage.

From debutanizer to deisopentanizer—isopentane overhead through condensers to storage. Bottom product: n-Pentane and heavier to gasoline storage.

Pure or finished products are blended from storage to make the materials demanded by the existing market.

Five individual product lines extend to a 34-car loading rack on the Burlington-Rock Island Railroad, delivery being made by individual Union Steam Co. reciprocating pumps. Also, a double truck-loading rack adjoining the plant is also connected to all product lines, and as mentioned above both loading facilities are equipped with a vapor recovery system.

4. Cycling of residue gas.—Residue gas from the reabsorbers in excess of fuel requirements is compressed to 1,500 psi., commingled with residue gas from the high-pressure absorbers, and the total residue gas boosted in a single stage to 4,100 psi. and returned to the field-injection system.

In order to increase the capacity of the injection wells and to obtain better control on the general injection pattern, a portion of this returned gas is boosted to a maximum of 5,000 psi. by two 225-hp. Ingersoll-and compressor units located in the field.

Description of Plant Auxiliaries

1. Cooling.—All cooling towers are of the Fluor induced-draft type with electrically driven fans. No. 1 tower is designed to cool jacket water, crankcase oil cooling, and field gas precooling, and recompressor intercoolers.

Centrifugal-type Union Steam Co. pumps driven by Hall-Scott gas pow-

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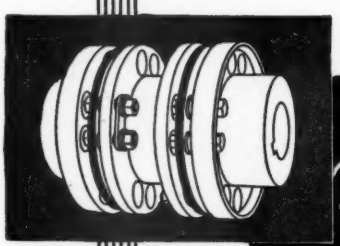

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er units are used to circulate cooling water over the tower and through the engine and compressor jackets and oil coolers. This type pump and driver are common to all water circulation jobs.

No. 2 tower (cold process) cools the water for secondary condensers on the distillate fractionator, low-pressure still, and product aftercoolers. Water for shell-and-tube condensers of the fractionator units is also taken from this tower.

No. 3 tower, or the hot process, is used to furnish cooling water to primary condensers on the distillate fractionator, high-pressure still, and low-pressure still.

2. Electricity. — Electric power is furnished by two 312-kva. Westinghouse 440-volt alternators directly driven from a 300-hp. 375-r.p.m. Ingersoll-Rand gas engine. A third identical unit is used as standby equipment.

3. Steam.—Live steam is used in shipping, tank-farm pumps and in process pumps. Exhaust steam from the turbines driving centrifugal process pumps is used for reboiler process heating in fractionation units. All exhaust steam is condensed and returned for boiler feed water. Three 485-hp. Combustion Engineering water tube boilers, each having a capacity of 40,000 lb. per hour compose the steam generating unit. This unit is housed in a galvanized steel building, which building with a fire-wall partition also houses the electrical generating equipment.

4. Water supply. — Water is furnished by three wells, two of which are drilled to a producing strata approximately 200 ft. deep, and the third to a sand at approximately 700 ft. in depth.

The more desirable water supply for 200 ft. is produced by means of air lift. The other is equipped with Layne multistaged centrifugal-type pump which is normally driven by an electric motor but may be operated in emergencies by a gas engine which is connected through a right angle gear and clutch to the well.

The 700-ft. well is equipped only with an electrically driven pump similar to the one described above. This well is normally on standby duty.

5. Office and laboratory.—The office and laboratory building is a one-story stucco black trimmed structure, interior finished very light green and black trimmed, completely air conditioned by a carrier system, throughcut the office space and three laboratory rooms. The laboratory is divided into separate rooms in order to isolate phases of control operations which involve the use of open flames.

6. Ice plant.—An ice plant utilizing propane as a refrigerant, and operating in connection with the above-described chiller system is used to manufacture ice for use in the field camps and for the laboratory.

7. Fire protection. — The complete plant may be shut down with the exception of the boiler plant by simply opening one of the several 1-in. plug valves located at strategic points throughout the plant.

The shutdown operation is accomplished by bleeding down the air supply of auxiliary motor valves which causes all engines to stop, cuts off incoming gas stream, opens flare valves on the absorbers and high-pressure residue lines within the plant, and shuts down the gas-fired heater on hot-oil system.

An Elliott turbine-driven Union steam centrifugal pump located in the boiler plant and also an auxiliary gas-engine-driven centrifugal pump located on the east side of the plant delivers water at 125 psi. to the fire main which encircles the plant.

Distillate-storage tanks are protected with a foamite system discharging directly under the roof of the tanks.

All storage tanks, consisting of four propane, two gasoline, three distillate, one isobutane, one normal butane, and one isopentane, are equipped with a system of water-spray nozzles from the fire system which may be opened from a distance to completely flood the tanks with water and protect them from excess heat caused by a fire in any adjacent tank.

Design and construction of this plant was by Fluor Corp., Ltd.

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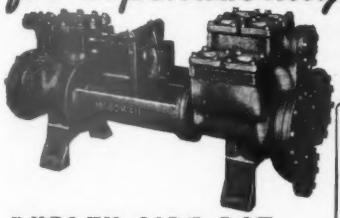

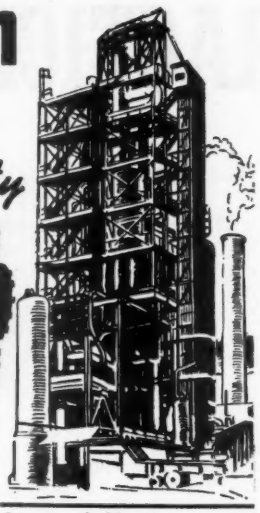

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Garlock 117 Valve Stem Packing, like other Garlock products, is manufactured completely in the Garlock factory and is *quality controlled* from raw material to finished product. Each ingredient, each process, each operation is checked to conform with established Garlock standards.

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GARLOCK 117 is made from long fibre asbestos yarn, thoroughly lubricated with a special heat-resisting compound. Gives long, dependable service on globe and angle valves operating against high pressure steam, hot or cold water, or oil.

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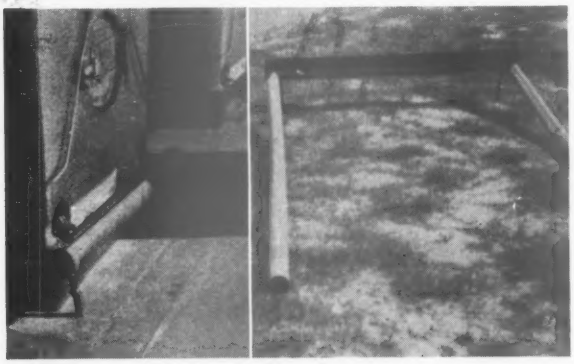
GARLOCK

PLANT PRACTICES

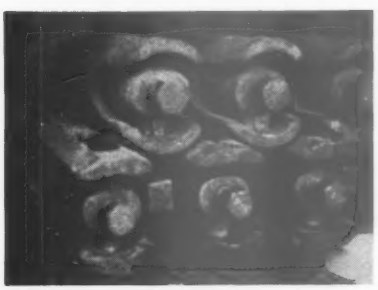
Portable Boiler Drain

AVOIDANCE of waste water from general floor area of the boiler room in gasoline plants is provided by portable drain system. When a boiler is shut down for some purpose and is to be drained, the drain-pipe arrangement



is simply carried to and set down adjacent to the handhole cover plates. The outgoing water drains down the inclined 2-in. pipes to the sump, and when complete, the drain may be removed to another boiler or returned to storage. (Idea used by Warren Petroleum Corp.)

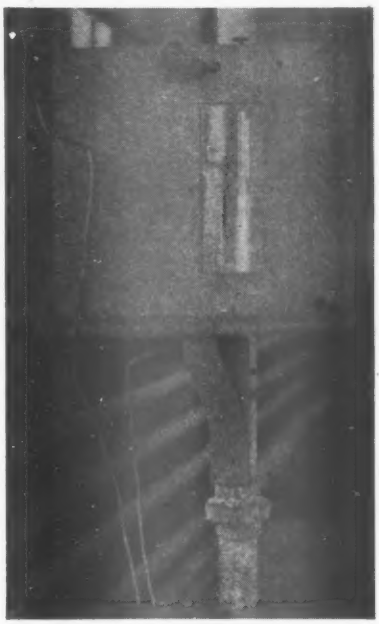
Replacing Tube Sheet



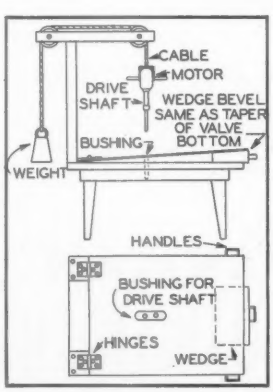
STANDARD OIL CO. OF OHIO'S No. 1 plant, Cleveland, had the problem of removing one row of cracking still tubes and replacing them, and also that of replacing a tube sheet without removing the headers from the tubes which were not to be replaced. They did this job by removing the tubes which were to be replaced; the old tube sheet was cut away with torches. The new sheet was split along the middle line of the tubes in the row remaining, the lower section of the sheet was slipped into place, the holes through which the tubes pass being bisected by the lengthwise cut through the sheet. The upper section of the sheet was also placed in position above the tubes. The two sections were welded together along the line visible in the photograph to make a solid sheet. The new tubes were then slipped through their holes and fitted into headers and into position in the conventional manner. Since it was necessary to cut the tubes from the headers, the removal of those which did not need replacement would have spoiled the tubes or made it necessary to weld on new ends if they were to go back into service; this method avoided this necessity of cutting them out of headers and saved many hours and much expense.

Apparatus for Taking Butane Gravity

THE accompanying picture shows an apparatus installed in a Kansas gasoline plant for taking specific gravity of butane. The setup is standard except the cabinet to provide protection for thermos bottles which are a part of the apparatus. In addition, this unit is arranged to eject the butane sample through lines to the cooler bottle. Thence, by changing valves, the stream can be directed through a cooling coil of copper tubing, which is immersed in a butane bath, and accumulated in the bottle where the sample is weighed by hydrometer and temperature taken. One line is hooked to the butane stream to be sampled, and the other to a vacuum line. The reason for the line to vacuum is to clear the apparatus of sample quickly. If the vacuum connection were not available it would be impossible to take a new sample without pouring old sample out. The cabinet is vented to avoid building pressure inside, and glasses are provided on either side of the thermos bottle that carries the weighing apparatus. In this manner the operator can read the results without handling the thermos bottle. The stoppers in the bottle are held in place by thumb screws taken from an old Hays analyzer. This apparatus is mounted on a base which is fastened to convenient 2-in. riser.



Method for Grinding Valve Bottoms



TO grind and refit valve faces a hinged table is employed on which the valve body is clamped in order to refinish the face to the required angle. (This idea originated with Julius F. Klasing, of the Baytown, Tex., refinery of Humble Oil & Refining Co.)

Thermodynamic Properties of Propane and Butane

MEASUREMENT of the physical and chemical properties of hydrocarbons as correlated and presented for practical use is based on the principles of thermodynamics. Values for physical or chemical properties as found in the literature may vary, depending on the source of these measurements and the methods used for their determination.

In the study of the properties of light hydrocarbons and tabulation of these data, it must be noted that the liquid properties of methane and ethane are given generally as projected for an apparent liquid. The standard reference temperature used in the tables, 60° F., is above the critical temperature of these gases, which therefore will remain essentially homogeneous in properties throughout the range of pressures, even to those above the critical pressure. The transition point from vapor to liquid could not be discerned by any method of observation or determination. In these data specific gravity of vapor or gas is the ratio of the weight of a unit volume compared to the weight of an equivalent volume of air at the standard temperature and pressure. Specific gravities of vapors and gases may be determined at any other combination of pressures and temperatures, and these values are always given to identify and specify exactly the values of gravity given. Density may be expressed as the weight of a cubic foot or other standard volume of vapor or gas at either the standard conditions—60° F. and 760 mm. of mercury pressure—or at any other set of conditions as may be stated.

The value of cubic feet of vapor per gallon of liquid is a value for the change in volume when a material is converted from the liquid to the vapor state. In vaporizing a unit volume—cubic foot for example—an individual pure hydrocarbon will form the same volume of vapor under the same temperature-pressure conditions, but its vapor volume will increase as pressure is reduced and/or as temperature is increased. In the accompanying tables the value of the different properties is that which obtains under the temperature-pressure conditions shown in the first three columns, which give absolute and gage pressures at the given temperatures. Again, the standard temperature-conditions for determining or reporting this value are 60° F. and 760 mm. of mercury (14.7 psi.) unless otherwise designated. The critical temperature and pressure for a gas or vapor are those at which the observer can discern no difference between the liquid and the vapor states. In other words, these critical conditions are those above which a vapor cannot be reduced to a liquid no matter how the pressure or temperature may be changed. Density of liquid and gas phases are identical under these conditions. Some gases follow the perfect gas law at temperatures ranging 10° to 20° F. above their critical temperatures, a condition which is never true at lower temperatures, it being necessary to make corrections for the variation of vapors and gases from this perfect gas law. These variations are due largely to the fact that the molecules of the gas occupy appreciable volumes and that therefore the gas does not have its whole apparent volume in which the molecules may move but only the apparent total volume less the volume actually occupied by the total num-

THERMODYNAMIC PROPERTIES OF SATURATED PROPANE

Enthalpies and Entropies are referred to saturated liquid at —200° F. where the values are zero.

Temp. °F. t	Pressure* Lb. per sq. in. Absolute p	Pressure* Lb. per sq. in. Gage g.p.	Specific volume* Cu. ft. per lb. Liquid v	Specific volume* Cu. ft. per lb. Vapor V	Density* Lb. per cu. ft. Liquid 1/v	Density* Lb. per cu. ft. Vapor 1/V	Enthalpy† B.t.u. per lb. Liquid hf	Enthalpy† B.t.u. per lb. Vapor hg	Latent† heat B.t.u. per lb. L	Entropy† B.t.u. per lb. °F. Liquid sf	Entropy† B.t.u. per lb. °F. Vapor sg	Temp °F. t
0	38.2	23.5	0.02895	2.71	34.54	0.369	106.2	277.7	171.5	0.231	0.605	0
+5	41.9	27.2	0.02913	2.48	34.33	0.403	108.8	279.0	170.2	0.236	0.604	+5
10	46.0	31.3	0.02931	2.27	34.12	0.441	113.3	280.5	167.2	0.246	0.603	10
15	50.6	35.9	0.02950	2.07	33.90	0.483	114.0	281.8	167.8	0.248	0.602	15
20	55.5	40.8	0.02970	1.90	33.67	0.526	116.8	283.1	166.3	0.254	0.601	20
25	60.9	46.2	0.02991	1.74	33.43	0.575	119.7	284.4	164.7	0.260	0.600	25
30	66.3	51.6	0.03012	1.60	33.20	0.625	122.3	285.7	163.4	0.266	0.599	30
35	72.0	57.3	0.03033	1.48	32.97	0.676	125.0	287.0	162.0	0.272	0.598	35
40	78.0	63.3	0.03055	1.37	32.73	0.730	128.0	288.3	160.3	0.278	0.597	40
45	84.6	69.9	0.03078	1.27	32.49	0.787	131.1	289.5	158.4	0.285	0.596	45
50	91.8	77.1	0.03102	1.18	32.24	0.847	134.2	290.7	156.5	0.292	0.596	50
55	99.3	84.6	0.03125	1.10	32.00	0.909	137.2	292.0	154.8	0.298	0.596	55
60	107.1	92.4	0.03150	1.01	31.75	0.990	140.6	293.2	152.6	0.306	0.595	60
65	115.4	100.7	0.03174	0.945	31.50	1.06	143.8	294.5	150.7	0.313	0.594	65
70	124.0	109.3	0.03201	0.883	31.24	1.13	147.5	295.8	148.3	0.321	0.594	70
75	133.2	118.5	0.03229	0.825	30.97	1.21	150.3	296.9	146.6	0.327	0.594	75
80	142.8	128.1	0.03257	0.770	30.70	1.30	154.0	299.1	145.1	0.335	0.593	80
85	153.1	138.4	0.03287	0.722	30.42	1.39	157.0	299.2	142.2	0.342	0.593	85
90	164.0	149.0	0.03317	0.673	30.15	1.49	160.3	300.3	140.0	0.349	0.593	90
95	175.0	160.0	0.03348	0.632	29.87	1.58	163.4	301.3	137.9	0.356	0.592	95
100	187.0	172.0	0.03381	0.591	29.58	1.69	166.8	302.4	135.6	0.363	0.592	100

*Based on material from Dana, Jenkins, Burdick, and Timm, published originally in Refrigerating Engineering, June 1926, Vol. 12, No. 12, page 403. †From Mollier Diagrams for Propane, W. C. Edmister, Standard Oil Co. (Indiana).

Engineering Fundamentals (Continued)

ber of molecules present.

Gage pressure is the difference between the total pressure or absolute pressure and the standard value for one atmosphere, or about 14.73 psi. Many scientific writings express pressures in atmospheres; 10 atmospheres is 10 times 14.73 or 147.3 psi. Pressures expressed in pounds may be converted to atmospheres by dividing the pounds value by 14.73.

The vapor pressure of a liquid or vapor is the pressure, expressed in any stated units, exerted upon a unit area of surface of liquid or of the container of a vapor, by the vapor under the stated conditions. This value may be expressed in any accepted terms under any given set of conditions but is generally expressed in terms of the results obtained from the standard Reid vapor pressure test (A.S.T.M.). In this test the dimensions of the test bomb, gage, and auxiliary parts are specified with careful exactness, with maximum permissible tolerances. The test itself is carried out under accurately specified conditions with extreme care, the bomb being immersed in a water bath maintained carefully at 100° F.

Latent heat of a hydrocarbon or other liquid is that amount of heat required to vaporize it completely, at its boiling point, without raising the temperature of the liquid and vapor. That is, pure water under standard pressure of 760 mm. of mercury boils at 212° F., and requires 970.2 B.t.u. per pound of water to convert the liquid into the vapor or steam, without any raising of temperature; that is, the steam is still at the same temperature of 212° F. when vaporization is complete, 970.2 B.t.u. of heat having been added per pound after the water reached the 212° F. temperature. The latent heat value varies with the temperature of boiling, which varies with the pressure on the liquid.

Heat of combustion of a hydrocarbon is the total amount of heat, in terms of standard units, released by the complete combustion of a unit weight of the hydrocarbon. Two standard units are employed, the metric calorie, or the large calorie or kilogram-calorie, 1,000 times the calorie, which is the amount of heat required to raise the temperature of 1 gram of water 1° C., at some standard temperature, as at 20° C. The British thermal unit is the amount of heat required to raise 1 lb. of water 1° F. at some standard temperature such as 60° F.

Enthalpy is the total heat content of a liquid, or the amount of heat required to raise the temperature of the unit weight of liquid from absolute zero—minus 460° F. or minus 273° C.—to the given temperature. Any other datum temperature value may be used, as 0° C. or 32° F. but must be expressed when giving enthalpy values. The enthalpy of a vapor is the enthalpy of the liquid to its vaporizing point plus the latent heat of vaporization plus the heat required to raise the vapor from the boiling point to the given temperature.

Entropy of a material is defined as the property of that material which remains constant while the material volume is changed or while work is being done during the volume change if no heat enters or leaves the material; if heat enters or leaves the system the entropy increases or decreases correspondingly. Entropy values are determined by dividing the product of the specific heat at constant volume times temperature change by its absolute temperature—degrees F. plus 460, or degrees C. plus 273.

Note: Many of these data are obtained from "Properties of Hydrocarbons"—Western Business Papers, Inc.

THERMODYNAMIC PROPERTIES OF NORMAL SATURATED BUTANE

Enthalpies and Entropies are referred to saturated liquid at —200° F where the values are zero.

Temp. °F. t	Pressure* Lb. per sq. in. Absolute p	Pressure* Lb. per sq. in. Gage g.p.	Specific volume* Cu. ft. per lb. Liquid v	Specific volume* Cu. ft. per lb. Vapor V	Density* Lb. per cu. ft. Liquid 1/v	Density* Lb. per cu. ft. Vapor 1/V	Enthalpy‡ B.t.u. per lb. Liquid hf	Enthalpy‡ B.t.u. per lb. Vapor hg	Latent‡ heat B.t.u. per lb. L	Entropy‡ B.t.u. per lb. °F. Liquid sf	Entropy‡ B.t.u. per lb. °F. Vapor sg	Temp. °F. t
0	7.3	†15.0	0.02591	11.1	38.59	0.0901	103.8	275.3	171.5	0.226	0.572	0
5	8.2	†13.2	0.02603	9.98	38.41	0.100	106.2	276.9	170.7	0.231	0.572	5
10	9.2	†11.1	0.02615	8.95	38.24	0.112	108.8	278.5	169.7	0.236	0.574	10
15	10.4	†8.8	0.02627	8.05	38.07	0.124	111.5	280.0	168.5	0.242	0.571	15
20	11.6	†6.3	0.02639	7.23	37.80	0.138	114.0	281.6	167.6	0.248	0.571	20
25	13.0	†3.6	0.02651	6.55	37.72	0.153	116.7	283.1	166.4	0.254	0.571	25
30	14.4	†0.6	0.02664	5.90	37.54	0.169	119.2	284.9	165.7	0.260	0.571	30
35	16.0	1.3	0.02676	5.37	37.37	0.186	121.8	286.4	164.6	0.264	0.571	35
40	17.7	3.0	0.02689	4.88	37.19	0.205	124.2	288.0	163.8	0.270	0.571	40
45	19.6	4.9	0.02703	4.47	37.00	0.224	126.8	289.5	162.7	0.276	0.571	45
50	21.6	6.9	0.02716	4.07	36.82	0.246	129.6	291.2	161.6	0.282	0.571	50
55	23.8	9.1	0.02730	3.73	36.63	0.268	132.1	292.7	160.6	0.287	0.570	55
60	26.3	11.6	0.02743	3.40	36.45	0.294	134.8	294.2	159.4	0.293	0.570	60
65	28.9	14.2	0.02759	3.12	36.24	0.321	137.3	295.9	158.6	0.298	0.570	65
70	31.6	16.9	0.02773	2.88	36.06	0.347	140.1	297.5	157.4	0.304	0.570	70
75	34.5	19.8	0.02789	2.65	35.86	0.377	142.6	298.9	156.3	0.310	0.570	75
80	37.6	22.9	0.02805	2.46	35.65	0.407	145.0	300.3	155.3	0.315	0.570	80
85	40.9	26.2	0.02821	2.28	35.45	0.439	147.8	302.0	154.2	0.322	0.570	85
90	44.5	29.8	0.02838	2.10	35.24	0.476	150.5	303.5	153.0	0.326	0.571	90
95	48.2	33.5	0.02854	1.96	35.04	0.510	153.1	305.0	151.0	0.332	0.571	95
100	52.2	37.5	0.02870	1.81	34.84	0.552	156.2	306.7	150.5	0.340	0.571	100

*Based on material from Dana, Jenkins, Burdick, and Timm, published originally in Refrigerating Engineering, June 1926, Vol. 12, No. 12, page 402. †Inches of mercury below one standard atmosphere (29.92 in.). ‡From Mollier Diagrams for Butane, W. C. Edmister, Standard Oil Co. (Indiana).

The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Caustic Soda (Sodium Hydroxide) Solutions

Per cent NaOH	Gravity			Weight of NaOH in solution		
	Specific	Baume	Twaddell	Gms. per liter	Lb. per U. S. gallon	Lb. per cu. ft.
0.5	1.0048	0.7	0.95	5.05	0.0421	0.315
1.0	1.0095	1.4	1.90	10.10	0.0842	0.630
1.5	1.0151	2.1	3.02	15.25	0.1273	0.952
2.0	1.0207	2.9	4.14	20.41	0.1704	1.274
2.5	1.0263	3.7	5.25	25.68	0.2143	1.603
3.0	1.0318	4.5	6.36	30.95	0.2583	1.932
3.5	1.0373	5.2	7.56	36.33	0.3032	2.268
4.0	1.0428	6.0	8.56	41.71	0.3481	2.604
4.5	1.0483	6.7	9.66	47.30	0.3939	2.946
5.0	1.0538	7.4	10.76	52.69	0.4397	3.289
5.5	1.0593	8.1	11.86	58.29	0.4864	3.639
6.0	1.0648	8.8	12.96	63.89	0.5332	3.989
6.5	1.0703	9.5	14.06	69.60	0.5808	4.345
7.0	1.0758	10.2	15.16	75.31	0.6285	4.701
7.5	1.0814	10.9	16.27	81.13	0.6770	5.064
8.0	1.0869	11.6	17.38	86.95	0.7256	5.428
8.5	1.0924	12.3	18.48	92.88	0.7751	5.798
9.0	1.0979	12.9	19.58	98.81	0.8246	6.169
9.5	1.1033	13.6	20.68	104.86	0.8750	6.546
10.0	1.1089	14.2	21.78	110.9	0.9254	6.923
11.0	1.1199	15.5	23.98	123.3	1.0193	7.697
12.0	1.1309	16.8	26.18	135.7	1.133	8.472
13.0	1.1419	18.0	28.39	148.5	1.240	9.240
14.0	1.1530	19.2	30.60	161.4	1.347	10.08
15.0	1.1640	20.4	32.81	174.7	1.458	10.91
16.0	1.1751	21.6	35.02	188.0	1.569	11.74
17.0	1.1861	22.8	37.23	201.7	1.683	12.59
18.0	1.1972	23.9	37.44	215.5	1.798	13.45
19.0	1.2081	25.0	41.63	229.6	1.916	14.33
20.0	1.2191	26.1	43.82	243.8	2.035	15.22
21.0	1.2301	27.2	46.02	258.4	2.157	16.13
22.0	1.2411	28.2	48.22	273.0	2.279	17.05
23.0	1.2520	29.2	50.40	288.0	2.404	17.98
24.0	1.2629	30.2	52.58	303.1	2.529	18.92
25.0	1.2738	31.2	54.77	318.5	2.658	19.88
26.0	1.2848	32.1	56.96	334.0	2.788	20.85
27.0	1.2956	33.1	59.12	349.9	2.920	21.84
28.0	1.3064	34.0	61.28	365.8	3.053	22.84
29.0	1.3172	34.9	63.43	382.1	3.189	23.85
30.0	1.3279	35.8	65.58	398.4	3.325	24.87
31.0	1.3385	36.7	67.69	415.0	3.464	25.91
32.0	1.3490	37.5	69.80	431.7	3.603	26.95
33.0	1.3593	38.3	71.84	448.7	3.744	28.01
34.0	1.3696	39.1	73.92	465.7	3.886	29.07
35.0	1.3798	39.9	75.96	483.0	4.031	30.15
36.0	1.3900	40.7	78.00	500.4	4.176	31.24
37.0	1.4001	41.5	80.01	518.1	4.324	32.34
38.0	1.4101	42.2	82.02	535.8	4.472	33.45
39.0	1.4201	42.9	84.01	553.9	4.623	34.58
40.0	1.4300	43.6	86.00	572.0	4.774	35.71
41.0	1.4397	44.3	87.94	590.3	4.927	36.83
42.0	1.4494	45.0	89.88	608.7	5.080	38.00
43.0	1.4589	45.7	91.79	627.4	5.236	39.17
44.0	1.4685	46.3	93.70	646.1	5.392	40.34
45.0	1.4779	46.9	95.58	665.1	5.551	41.52
46.0	1.4873	47.5	97.46	684.2	5.710	42.71
47.0	1.4969	48.2	99.38	703.6	5.877	43.92
48.0	1.5065	48.8	101.30	723.1	6.035	45.14
49.0	1.5159	49.4	103.18	742.9	6.200	46.37
50.0	1.5253	49.9	105.06	762.7	6.365	47.61

Degrees Twaddell = 200 (Sp. Gr. — 1). Reference—Tabulation taken in part from Lange's Handbook of Chemistry, 1944.

No. 79 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

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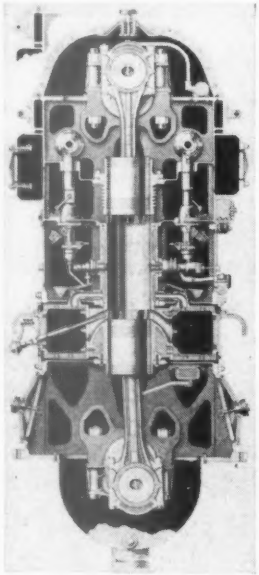
OIL AND GAS EQUIPMENT Digest

IT'S NEW ✓ CHECK IT

by Joe Cahill

(1) OPPOSED-PISTON DIESEL ENGINE uses two pistons in each cylinder, driven apart by a central explosion. No cylinder heads or valves. The block has transverse vertical members with horizontal decks to form enclosures, bearing housings, and fastenings for operating parts. Horizontal decks are bored to receive the cylinder liners (removable) along the center line of the engine. The two pistons in each cylinder have four basic functions: (a) To act as movable gas and compression tight closures for the cylinder; (b) to function as valves to admit scavenging air and permit exhaust of the combustion gases; (c) to form the combustion space between their recessed heads; (d) to transmit the power of the expansion forces to the connecting rods and crankshafts. Pistons have oil cooled heads and upper and lower crankshafts transmit the power to the vertical drive gears and crankshaft coupling. Fuel system has supply and injection divisions. Pressure lubrication and piston-cooling systems supply continuous flow of oil.



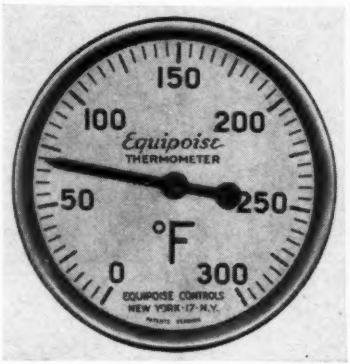
Water cooling is a closed system, with a lubricating oil cooler incorporated. Scavenging air supplied at 3 to 6 psi. by two three-lobe spiral impellers. Exhaust system has large, water-jacketed passages built into the engine frame. Fuel-control system uses Woodward governor to regulate automatically position of the fuel-injection pump plungers in accordance with the load. *Fairbanks, Morse & Co.*

IT'S NEW ✓ CHECK IT

(2) LIQUID PLASTIC COATING. New surfacing material is one of the new inert plastic resins. Its resistance to mineral acids and alkalies or their salts, its dielectric qualities and opposition to vapor permeability, all mean practically permanent protection from corrosion. Can be applied to metal, wood, or concrete surfaces. *Federal Electric Co., Inc.*

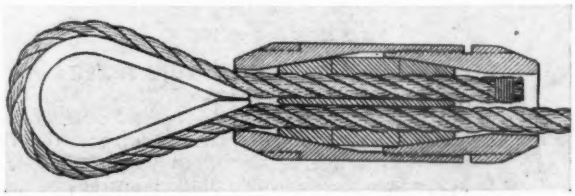
IT'S NEW ✓ CHECK IT

(3) NEW BIMETALLIC DIAL THERMOMETER features permanently-calibrated, highly accurate and extremely responsive helical-coil measuring element. Expansion rotates small shaft and indicating pointer as one unit over entire scale range. No pivots, mechanical linkages or gears. Rugged construction protects thermometer against corrosion, vibration, shock, and rough handling. Standard ranges are available between limits of —90° F. and 1,000° F. Test or laboratory thermometers are graduated in both C. and F. on same scale. *Equipoise Controls.*



IT'S NEW ✓ CHECK IT

(4) NEW WIRE ROPE CLAMP incorporates a new wedging action in its component parts. Holds loads in excess of the tensile strength of the rope used. The unit is alloy steel, cadmium plated for weather protection,



streamlined for neat appearance and freedom from obstruction. Easily assembled by unskilled labor and may be readily disassembled for the tightening of stretched

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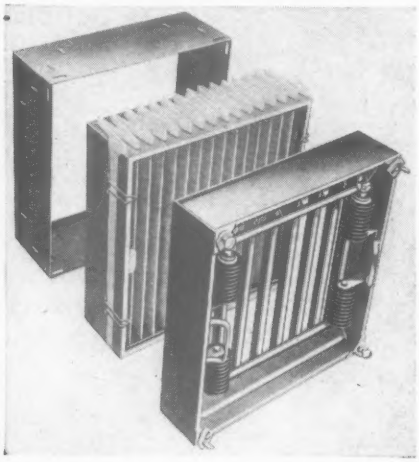
lines or other uses. Made in all standard sizes from 1/16 in. to ¾ in. *Nunn Manufacturing Co.*

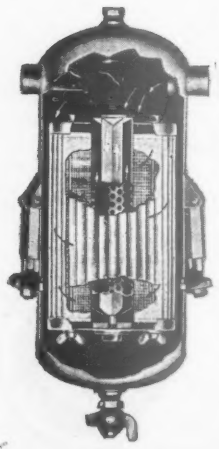
IT'S NEW CHECK IT

(5) ELECTRO-AIRMAT. Introducing new principles in electronic air filtration, the arrestance rating, when tested by the discoloration method, is 90 per cent or better with atmospheric dust or smoke, at a velocity of 35 f.p.m. and the standard rating of 1,000 c.f.m. per standard-sized 24 by 24-in. unit. Weighs 40 per cent less than filters having metal-plate collectors and requires 30 per cent less floor area. Composed of a number of plies of porous, tissue-like sheets formed of



short cellulose fibers in "jack-straw" arrangement. When an electrostatic charge is applied, the plies tend to separate and each individual fiber becomes a collecting electrode which attracts and holds the dust and smoke particles. Also a highly efficient mechanical filtering medium. Filter is replaced by turning a crank in a mechanical loader which automatically folds the paper into the serrated base section of the filter unit. *American Air Filter Co.*

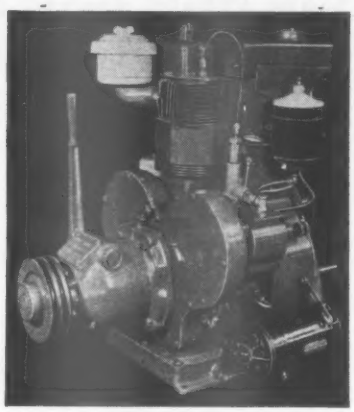
IT'S NEW CHECK IT



(6) NEW LIQUID FILTER features new design of filter insert consisting of inner and outer radial finned forms of wire cloth. The outer form, on which the filtering medium is crimped, slips over the inner form. Top and bottom plates and seal gaskets are then applied and the whole assembly held in place by through bolts. The insert permits the use of practically any type of filtering medium that can be crimped. Also permits replacement in the field. Spare insert outer forms may be stocked in a variety of media ready for instant change or replacement. *Dollinger Corp.*

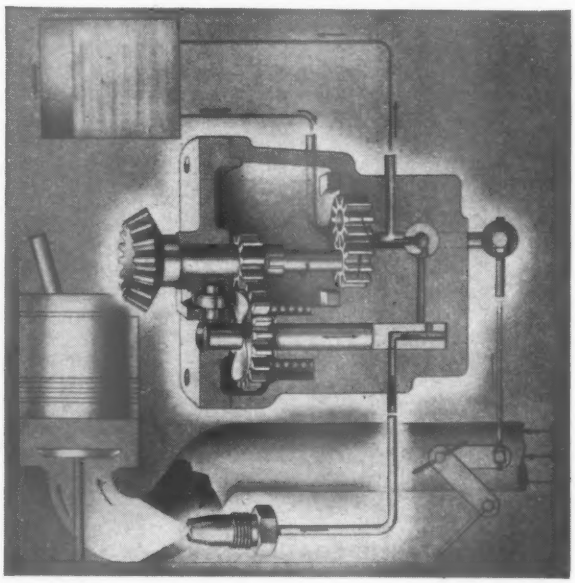
IT'S NEW CHECK IT

(7) A NEW DIESEL ENGINE being built is unique not only because it's the smallest diesel ever built for commercial use, but also because it's air-cooled. In spite of the intense temperatures the air cooling is so efficient that a hand can be laid on the cylinder without discomfort while the engine is operating at full load. Single cylinder, four cycle, developing 3¾ hp. at 1,800 r.p.m., 3-in. bore, 4-in. stroke. Piston speed 1,200 f.p.m. at 1,800 r.p.m. Piston displacement 28 cu. in. Standard governor regulation is 3½ per cent. It is equipped with both hand and electric starting. Also available direct-connected to a 2-kw. generator with control box and rheostat. *R. H. Sheppard Co.*



IT'S NEW CHECK IT

(8) NEW GASOLINE INJECTION SYSTEM, to replace plane engine carburetor, is designed to meter mechanically the correct quantity of gasoline to the various engine cylinders and provide a positive control of the fuel-air mixture for best combustion. Advantages claimed are elimination of accidents caused by carbu-

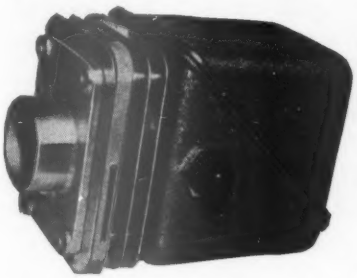


retor icing; equal distribution of fuel to all cylinders, reduced gasoline consumption and increased engine life through lowering of cylinder head temperatures; increased engine power and plane speed; smoother engine performance and better idling. The new system is simple in design and construction, having a minimum of parts. *Ex-Cell-O Corp.*

IT'S NEW CHECK IT

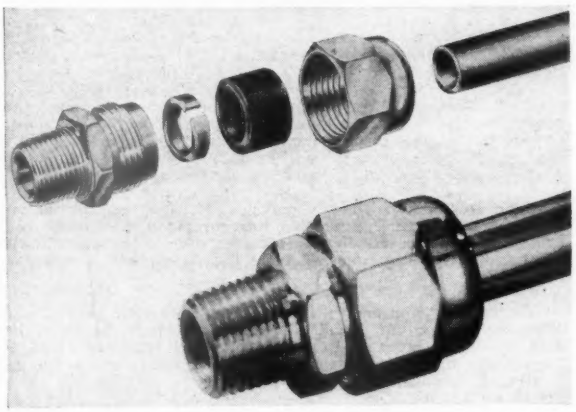
(9) PHOTOELECTRIC FLAME FAILURE SAFEGUARD, designed to provide explosion protection for all commercial oil and pulverized coal burners. Photoelectric—when flame fails, it instantly cuts off fuel and sounds

an alarm. Unlike thermal controls, actuated by the flame itself. Consists of a phototube and amplifying system, housed in dust-tight aluminum case. The entire control is mounted directly on the furnace wall and is aligned in a manner which permits the photo-electric cell to observe the flame through a 2-in. pipe connection which serves as both a sighting tube and a support for the equipment. Other features include a pilot light which can be viewed through an angle of 180°, and a time delay element which prevents the relay from dropping out during purely transient flame disturbances. *Combustion Control Corp.*



IT'S NEW CHECK IT

(10) NEW TUBING FITTING eliminates end preparation or soldering and yet produces a stronger, leakproof and flexible joint. Made in standard sizes from ⅛ to 1½ in. o.d. Consists of four parts—body, gripping ring,



gasket, and nut. Elimination of flaring, swedging, or soldering the tube end adds to the strength of the joint as well as saving time and labor. Available in brass, aluminum or steel. *Gustin-Bacon Mfg. Co.*

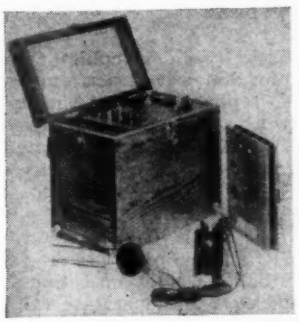
IT'S NEW CHECK IT

(11) NEW, SIMPLE TOOL FOR REPLACING GASKETS IN FLANGED PIPE LINES opens pipe flanges for gasket renewal without damage to flange faces, and without danger from sparks. Danger from chips and flying wedges is also eliminated. Operates with a minimum of labor—important in tight, cramped locations. Exerts tremendous pressures smoothly and evenly—eliminates vibration and the possibility of causing new leaks in nearby joints. Capable of opening joints against a load of 15 tons. Bolt holes maintained in continuous alignment. Simple in design; jaws heavy, one-piece steel forgings; screw points case hardened. Standard sizes open all 2 to 20-in. flanges. *T. G. Persson Co.*

IT'S NEW CHECK IT

(12) AIR AND GAS CLEANER. New-type air cleaning tube used in multiples up to any desired capacity, has high precipitating efficiency and develops no pressure buildup. Air is exhausted from central tube while the dust is precipitated from bottom. Being used for reclaiming valuable powders; intakes on diesel and gas engines; cleaning dust-laden air in industrial and chemical plants; and other applications requiring higher collection efficiency than obtainable in standard dust collectors. Single tube has a capacity of 30 c.f.m at 4-in. w.g resistance. *Aerotec Co.*

IT'S NEW CHECK IT



(13) COMBINED CABLE AND PIPE LOCATOR tells where cable or pipe is buried, and just how deep. Especially valuable for checking depth at river crossings, determines whether or not a service pipe is below the frost line in lowering or regrading. Furnished with detector coil, neutral coil, fish-scale exploring coil. *W. C. Dillon & Co., Inc.*

IT'S NEW CHECK IT

TRADE LITERATURE

(14) METALLIC PACKING for reciprocating, centrifugal, and plunger units is the subject of this 16-page pamphlet. Gives construction details, specifications, and line drawings of applications. *Rodpak Mfg. Co.*

IT'S NEW CHECK IT

(15) HARD FACING FOR CORROSION PROTECTION. New pamphlet gives concise data on application of hard-facing materials for corrosion resistance. Two new ways for application of hard-facing alloy are illustrated. *Haynes Stellite Co.*

IT'S NEW CHECK IT

(16) HEAVY-DUTY TRUCKS. Four new heavy-duty trucks, ranging from 3 to 15 tons, are announced in this manufacturer's catalog. Included in this new series are

4 by 4's and 6 by 6's, for rugged oil field service. *Four Wheel Drive Auto Co.*

IT'S NEW ✓ CHECK IT

(17) ARC-WELDING ACCESSORIES. Twelve-page booklet illustrates and describes complete line of accessories for all types of welding machines and operations. Section devoted to Heli-welding equipment developed for welding magnesium. *Air Reduction Sales Co.*

IT'S NEW ✓ CHECK IT

(18) A STUDY OF COSTS. A series of five economic studies just published show new and improved methods as applied on an individual basis can reduce over-all manufacturing cost while at the same time providing a yield of improved quality. These studies comprise analyses of five typical American refineries, processing different crudes with varying equipment, and are designed to serve large and small refining organizations in considering peacetime problems. *M. W. Kellogg Co.*

IT'S NEW ✓ CHECK IT

(19) NEW GUIDE FOR PIPE USERS. A new catalog featuring applications of lightweight pipe in diameters from 4 to 30 in. has just been issued. Illustrated are installations showing applications in the many fields in which lightweight pipe is used to advantage. Along with valuable data on pipe structure are sections on precision fabrication and pipe connections including an entirely new type of coupling which saves time and labor for users. *Naylor Pipe Co.*

IT'S NEW ✓ CHECK IT

(20) OIL-FIELD ENGINES. Eight-page pamphlet, well illustrated, includes installation dimensions, performance curves, operation data, and a phantom view showing the method of combining two or four engines into one output shaft. Good, sound information for those interested in industrial diesels. *Detroit Diesel Engine Division.*

IT'S NEW ✓ CHECK IT

(21) SILICONE GREASES. Data sheets on two new silicone greases serviceable in ball bearings operating at speeds up to 10,000 r.p.m. and over a temperature range of —94° F. to 345° F. Published by the manufacturer in response to interest shown in reports of these greases to meetings of the Society of Automotive Engineers. *Dow Corning Corp.*

IT'S NEW ✓ CHECK IT

(22) PLASTIC SHOTHOLE CASING. New lightweight plastic casing for seismograph explorations features great strength, light weight, and pressure resistance. Manufacturer's catalog shows casing and accessories, as well as repair parts, applications, and price list. *Federal Electric Co., Inc.*

IT'S NEW ✓ CHECK IT

MEN IN THE NEWS

F. T. YOUNGMAN

C. W. JOHNSON

JOHN TEER

Fred T. H. Youngman, formerly executive vice president, has been elected president of Jessop Steel Co., Washington, Pa. He succeeds **R. Edson Emery,** who was made chairman of the board. Three new directors are **W. C. Buchanan,** president of Globe Steel Tubes Co., Milwaukee; **Andrew J. Dallstream,** senior partner, Pam, Hurd & Reichmann, Chicago; and **Linwood A. Miller,** Chicago, formerly president of Willys-Overland Motors.

Establishment by Continental Motors Corp. of a general service and distributor sales department under the direction of **C. Wheeler Johnson,** newly elected vice president, is announced today by **C. J. Reese,** president. Johnson became associated with Continental a year ago, following 17 years with the Oliver Corp., manufacturer of farm equipment.

Reed Roller Bit Co. announces the return of **John Teer** to the organization as special representative. Teer will be located in Houston.

E. T. Tuller has been appointed domestic sales manager of Athey Products Corp. He joined the company in 1940 as special representative in the introduction of the force-feed loader to distributors' sales organization. In 1943 he was appointed district representative, taking over the central sales division.

John D. Todd, petroleum geologist, Houston, announces that he, along with several associates, has purchased the Cambe Blue Print Co. to print and distribute copies of electric logs. **Charles Blankenship,** recently released from the Army, will manage the firm.

Clarence L. Johnson, a member of the sales staff at the Dugas office at Chicago for Ansul Chemical Co., Marinette, Wis., has been appointed manager of that office. He succeeds **Floyd M. Duvall** who has been transferred to Indianapolis where he will be district manager of refrigeration sales.

Iron & Steel Products, Inc., Chicago, announces the election of **E. D. Connell,** manager of the merchant iron and steel department, as vice president.

A. E. Cudlipp, vice president, Lufkin Foundry & Machine Co., and president, Texas Motor Transportation Association, has been elected vice president of American Trucking Association for Texas.

E. T. TULLER

C. BLANKENSHIP

C. L. JOHNSON

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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Natural Gas

FPC's Natural-Gas Hearing In Charleston Postponed

WASHINGTON. — The regional hearing in Federal Power Commission's investigation of the natural-gas industry originally set for Charleston, W. Va., on March 19 has been postponed by the commission to April 12.

The regional hearing in Chicago, beginning February 19, is to be held in the courtroom of the Circuit Court of Appeals. No hearings beyond the one in Charleston have been scheduled by the commission thus far.

Industry Entering Its Most Promising Era, Says Wolf

NEW YORK.—The gas industry is entering the most promising area of its 126-year existence, according to H. Carl Wolf, managing director of American Gas Association. Four years of war, he points out, have created a backlog of approximately 4,000,000 gas ranges needed to meet normal demands. Gas-refrigerator requirements are estimated at more than 2,000,000 units. Gas water heaters and gas air-conditioning units practically were put out of production during the war years, and now are in lively demand.

New home construction, remodeling of dwellings, and proposed expansion of commercial and industrial plants, together with new industrial uses for gas discovered through research and development programs of the association and individual companies, offer vast potential markets both for gas utility companies and gas appliance manufacturers, Wolf says.

Many of these markets will be highly competitive, but competition is the greatest incentive of American industry, says the association's managing director. Viewers-with-alarm are likely to overlook the achievements of the gas industry and get a false perspective of its competitors' achievements.

Keenest competition is expected in the field of domestic cooking. Competitive fuel industries have publicized impressive figures of gains made in this field. The gas industry's record here also is noteworthy, since approximately 20,000,000 of the nation's 35,000,000 families used gas for cooking at the end of 1945. This means where gas is available, either on city mains or by delivered tanks or cylinders, about two out of three families choose gas.

In the past 10 years, annual sales of gas ranges have averaged 150 per cent of the number of ranges sold in 1935. In the 5 years before the war, when competition in the cooking field was heaviest, sales of gas ranges were 106 to 169 per cent of sales in 1937, which was one of the best prewar years. Gas range sales in 1938 declined to 72 per cent of the 1937 figure. In 1939 they totaled 106 per cent of the 1937 figure; in 1940 they totaled 123 per cent and in 1941, there were 2,277,000 gas ranges sold, or 169 per cent of the 1937 sales.

The gas industry carefully planned in advance for this huge postwar market and now it is prepared to meet all competition and to retain its position of leadership as the ideal fuel for the home.

Canadian Companies Plan $7,000,000 Expansion

NEW YORK. — An expansion program involving the expenditure of approximately $7,000,000 during the next 4 years for additions and extensions to Canada's gas system is planned by two companies.

The program was announced here by the International Utilities Corp. for two Canadian subsidiaries, North-Western Utilities, Ltd., Edmonton, Alta., and Canadian Utilities, Ltd., Calgary. A central Alberta pipe line is planned to carry fuel from the Kinsella and Viking gas fields to Red Deer, Lacombe, Wetaskiwin, Camrose and other communities.

Wells in Heyser Field to Get Gas-Oil Ratio Test

AUSTIN.—With a view of reducing waste of casinghead gas, engineers of the State Railroad Commission will test the gas-oil ratio of each well in the Heyser field, Calhoun County. The commission has asked all operators in the field to cooperate in the tests, which were started February 1. The Murray committee which conducted gas-waste surveys in the principal oil fields of Texas, has made one inquiry in the Heyser field.

A special committee of engineers familiar with the field said the average ratio now is 4,072 cu. ft. of gas per barrel of oil produced. It recommended a 2,000-to-1 maximum, and suggested transferring allowables from high-ratio to low-ratio wells.

The committee also said that negotiations are in progress to spend $1,115,000 for a cycling plant, which would gather casinghead gas from all wells in the field, extract liquids from it, and sell the residue to gas pipe lines.

Texas Instrument Society Organized by Engineers

CORPUS CHRISTI. — Control and measurement engineers in this area have organized the South Texas Instrument Society and plan to affiliate their group with the Instrument Society of America, a new national organization.

Meetings are held the second Tuesday of each month. Men interested in and working with controlling and measurement equipment of any type are invited. Information regarding the organization is available from J. G. Pratt, 526 Villa Drive, Corpus Christi.

Natural Gasoline

Changed Conditions to Be Discussed by N.G.A.A.

Preparations are being made for the first open discussions of radically changing conditions in the natural-gasoline industry in several years, at the 25th annual convention of Natural Gasoline Association of America, to be held April 17-19 at the Baker Hotel, in Dallas.

Commenting on plans for the 3-day meeting, J. H. Dunn, president of Shamrock Oil & Gas Co. and president of N.G.A.A., pointed out that the industry is passing from its traditional "one product" phase into one of broadly expanded operations in which it probably will meet demands for many products.

"Both the natural-gasoline and cycling industries are in enviable positions today with respect to motor fuel and chemical raw material markets," said Dunn. "Their modern plants have an efficiency of fractionation permitting the maximum extraction of valuable hydrocarbons either as pure products or in many desired blended combinations. This war stimulated modernization. Introduction of new processes and the potentialities of the changed operations need to be studied and correlated, and that is to be the theme of this convention."

P. M. Raigorodsky, vice president of Glen Rose Gasoline Co., Houston, heads the convention program committee.

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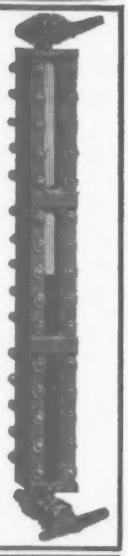

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REFINING

Delayed Coking Cuts Costs By Improving Feed Stocks

With peacetime economics taking the place of wartime-production pressure in the oil refining industry, the advantages of modern delayed coking are assuming a steadily growing significance, it is pointed out in the current issue of the Kelloggram, published by The M. W. Kellogg Co. Delayed coking, this issue states, reduces the oil refiner's overall operating costs by increasing the efficiency of catalytic-cracking units.

The technical progress made in this process and its widening application in the oil refining industry during the past 15 years are analyzed in a feature article. Following the origination of the concept by the Standard Oil Co. (Indiana), Kellogg continued development and refinement of the process at its Jersey City laboratories.

"The first combination unit incorporating delayed coking was designed and erected in 1937," the article adds, "following which Kellogg has built seven other such units covering a wide range of capacities."

"In its modern version, delayed coking is installed as a continuous thermal cracking process designed to produce maximum yields of extra-clean catalytic-cracking feed stocks from any type of reduced crude." Flexibility and simplicity are cited as outstanding operating features of the process.

This issue of the Kelloggram also includes an article analyzing from an engineering viewpoint the notable wartime performance record of a fluid cat-cracking unit installed in December 1943 at Aruba, Dutch West Indies, for the Lago Oil & Transport Co., a subsidiary of the Standard Oil Co. (N.J.) "Converted since V-J Day to production of motor gasoline," the article states, "this unit also has proven its adaptability to produce economically, through changes in operating conditions, any quality of gasoline envisioned at the present time for the postwar market."

Illinois Gallonage Report Shows 13 Per Cent Rise

SPRINGFIELD, Ill.—A 13.08 per cent rise in gasoline consumption in Illinois in October 1945, over the same month in 1944 is shown by figures from the motor-fuel tax division of the state Department of Finance.

October's total was 117,985,642 gal. compared to 104,338,080 gal. in October 1944. Revised figures for September 1945, showed a total of 119,215,964. Gasoline tax collections for October 1945, were $3,474,648. Gallonage list by companies was led by Standard Oil Co. of Indiana with 22,801,969 gal. for the month. Next was Shell Oil Co. with 9,797,117 gal.

Minnesota's Inshipments Increase 29 Per Cent

ST. PAUL.—Minnesota's inshipments of petroleum products in November increased 29 per cent over 1944 to a total of 80,641,213 gal., according to the petroleum division of the state Department of Taxation.

The state collected $1,836,057 in gasoline taxes on November inshipments, compared to $1,570,220 for the same month in 1944. Tax-exempt sale of products to the United States Government declined to 81,379 gal. in November 1945, from 180,093 in November 1944 and 365,769 gal. in November 1943. Fuel-oil inshipments in November 1945 were 30,862,259 gal. against 19,305,921 for November 1944.

Data Available on German Isoparaffin Synthesis

WASHINGTON.—Results of research work done by German scientists in isoparaffin synthesis is now available for study by American petroleum chemists and refining experts from the Department of Commerce.

The data are contained in one of a series of reports on German wartime study of the Fischer-Tropsch process. It is being released through the Commerce Department by the Navy technical mission in Europe and the combined intelligence objectives subcommittee.

The report was prepared by Lt. D. R. Dewey, U. S. N. R., in whose opinion, development of the Fischer-Tropsch process may result in its becoming the most versatile of all synthetic-fuel processes.

Research workers at Kaiser Wilhelm Institute are reported by the United States investigator as having obtained good yields of isoparaffins through use of the normal synthesis gas (containing hydrogen and carbon monoxide in approximately 1:1 ratio)

at 300 atmospheres pressure and 420°-450° C., with an aluminathoria catalyst. Yields of about 120-130 grams of paraffinic constituents, consisting of three or more carbon atoms, per meter of synthetic gas are reported, and the isoparaffins reportedly run in excess of 90 per cent.

Cuban Motorists Must Use Alcohol-Gasoline Mixture

HAVANA.—In an effort to protect the alcohol industry which boomed during the war, President Ramon Grau San Martin and his cabinet have ordered Cubans to use a wartime combustible fuel made of two-thirds cane alcohol and one-third gasoline.

Cuban motorists complain the fuel, known as carburante nacional, is inefficient and injurious to motors, but the presidential decree making its use obligatory is expected to remain in effect until the Congress approves permanent protection for the island's alcohol industry. The fuel is not subject to the Cuban gasoline tax of 17 cents a gallon, but it is sold at the higher price of 40 cents a gallon.

Ethyl Corp. Studies Raise In Octane Specifications

NEW YORK. — While representatives of Ethyl Corp. have been visiting refineries to explore the capabilities of meeting higher octane specifications for premium gasoline, a company spokesman reports that there has been no decision to date on raising specifications.

Moreover, it was pointed out that Ethyl has been granted sufficient pig lead to meet all normal requirements during the first quarter of 1946 and has every expectation of being able to meet market demands in the second quarter — despite some rumors that increased demands made by large lead users would decrease Ethyl's requirements.

Compared with some other manufacturers who use large quantities of lead—such as industries making batteries, electric cable, and white paint —Ethyl uses only approximately 6 to 7 per cent of all lead consumed in this country.

Word in some oil circles a short time ago was that Ethyl wanted to set an 80-octane minimum for premium to assure marketers of more uniform conditions in that some gasoline is now being sold under the Ethyl sign which is below 80 octane. However, it is reported that most refiners are selling gasoline at 80 or above.

Anglo-Iranian Building Fluid Cat Cracker

The Anglo-Iranian Oil Co., Ltd. has announced plans to install a fluid catalytic-cracking plant at its Abadan, Iran, refinery. The plant, which will have a capacity of 24,500 bbl. daily, will not be completed until 1947.

The Abadan refinery has a crude-oil throughput capacity of 385,000 bbl. daily, being the largest single refinery of the petroleum industry. During the war period, a large amount of war product equipment was installed and the refinery was producing approximately 30,000 bbl. daily of 100-octane gasoline when the war ended. This was accomplished without the use of catalytic cracking. The refinery operation includes isomerization, large alkylation capacity and units with a reforming capacity of more than 100,000 bbl. daily.

Imperial to Build Canada's First Catalytic Cracker

MONTREAL.—Several million dollars will be spent in construction of additions to the Imperial Oil, Ltd., refinery at Montreal. A feature of the new construction will be a catalytic cracker, the first in Canada, a structure equal in height to a 15-story building and incorporating the fluid catalyst method of cracking.

Other construction work will include a 4,200-bbl.-per-day catalytic polymerization plant and remodeling of existing equipment. Work is expected to begin this spring. An estimated 1,025 men will be employed at the peak of construction.

The new units will occupy approximately 270,000 sq. ft. of space and will require 18,000 tons of steel, 200 tons of alloy steel, 1,500 tons of cast iron, and 25 tons of copper and brass. New storage tanks with a capacity of more than half a million barrels also will be installed. This additional tankage capacity will permit refining at a uniform rate of 27,400 bbl. per day.

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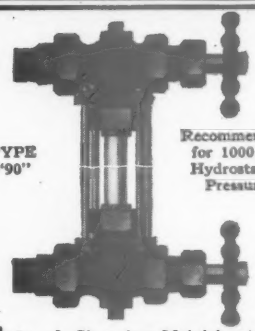

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PIPE LINES

Texas-Los Angeles Pipe Line Hearing Set February 13

WASHINGTON. — The application of three gas companies, El Paso Natural Gas Co., Southern California Gas Co., and Southern Counties Gas Co. of California, for permission to construct and operate natural-gas pipe lines from Texas to the Los Angeles area, will be heard February 13 by the Federal Power Commission. Additional testimony will be taken later in Los Angeles.

A 1,000-mile, 24 and 26-in. line from Dumas, Tex., to the California-Arizona state line near Blythe, Calif., is proposed by El Paso company. Estimated initial cost of facilities to deliver 125,000,000 cu. ft. daily is $27,822,000. The joint application of the Southern California companies asks approval for a 214-mile, 26-in. line from El Paso's proposed terminal to Santa Fe Springs, Calif., where a connection would be made with a line serving Los Angeles. Estimated initial cost of the 214-mile line, with a daily capacity of 175,000,000 cu. ft., is $12,140,000.

Radio Telephone Adapted For Pipe-Line Operation

FORT WORTH.—A two-way radio telephone network is the latest improvement in pipe-line operating technique in the Southwest.

Such a network is now being used by United Gas Pipe Line Co. with approval of the Federal Communications Commission to operate its 24-in. gas line from Panola County, in East Texas, to Sterlington, La. It consists of central stations at Shreveport and at Sterlington with a power output of 250 watts, and one at Carthage, Tex., with 50 watts. Forty-four portable-mobile units also are in service on cars and trucks.

War-Built Pipe Line Finds Place in Nation's Industry

NEW YORK. — A war-built emergency pipe line promoted by the federal Government has now found itself in such a secure position that investors here forced their way into underwriters' offices and demanded the "right to subscribe" to its stock issue.

The line is the 1,265-mile connection of the Tennessee Gas & Transmission Co. extending from southern Texas to West Virginia. The faith of the investing public in the line as demonstrated here indicates it is assured of a permanent place among postwar industrial resources. Its history is in sharp contrast with that of many wartime industrial projects.

Underwriters made a public offering of about half of the company's common stock at a price of $9,745,200. Before the day was over, it was oversubscribed, and the stock selling at a premium in the unlisted market. Anticipating the sale, investors sought before hand to get "priority" for orders.

A future such as this was far from the thoughts of those who organized the company in 1940. First plan was to pipe natural gas from Louisiana to markets in Tennessee but this was abandoned. In 1942, with a shortage of gas threatening war industries in the Appalachian region and with the local supply dwindling, the company borrowed $44,000,000 from the Reconstruction Finance Corp. to build the

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Texas-West Virginia line with the stipulation that it be finished in a year.

The Chicago Corp., a capital investment company with Texas gas interests, put up $9,000,000 "venture money." White, Weld & Co. advanced $1,000,000.

Proceeds from the recent stock sale will be used to buy four compressor stations from the RFC. The pipe line is now carrying a daily average of 200,000,000 cu. ft.

Northern Natural System To Undergo Expansion

WASHINGTON. — Federal Power Commission has granted to Northern Natural Gas Co., of Omaha, Neb., authority to construct facilities designed to increase delivery capacity of the company's gas pipe-line system to its market area north of Clifton, Kans., from an estimated 260,000,000 cu. ft. daily to 270,000,000 cu. ft. The additional facilities will cost about $1,-407,748.

Northern Natural's demands for natural gas during the war years increased substantially. These demands were accelerated as a result of relaxation of wartime government controls, coupled with the release of an accumulation of war demand for natural-gas service and gas appliances. The authorized facilities include:

1. Approximately 20 miles of 20-in. loop line in Iowa, extending north from Natural's Ogden compressor station at an estimated cost of $469,-417.

2. Approximately 10 miles of 24-in. loop line in Kansas, extending northeasterly from a point about 24 miles northeast of the company's Mullinville compressor station in continuation of an existing loop line, at an estimated cost of $291,043.

3. Seven miles of 24-in. loop line, extending northeasterly in continuation of an existing loop in the vicinity of the Bushton compressor station at an estimated cost of $213,099.

4. Approximately 13½ miles of 24-in. line extending southwesterly from the company's Beatrice compressor station at an estimated cost of $434,-189.

Northern Natural's operations include transportation of natural gas produced in Texas, Oklahoma, and Kansas, and the sale of such gas for resale for ultimate public consumption in Kansas, Nebraska, Iowa, Minnesota, and South Dakota by means of its interconnected pipe-line system.

Skelly Completing 47 Miles Of Lines in Hugoton Field

GUYMON, Okla. — A natural-gas pipe-line gathering system with a capacity of 80,000,000 cu. ft. daily is nearing completion in the Guymon sector of the Hugoton gas field for Skelly Oil Co.

The 47-mile system of lines ranging from 4 to 22 in. will serve Skelly's leaseholds on the west and southwest portion of the field. J. C. Carlson & Son, Pampa, Tex., is the contractor.

Tariffs Published for Use Of New Great Lakes Lines

KANSAS CITY.—Rates for gasoline and distillate fuel of 48 cents a barrel from the Oklahoma-Kansas area to Sioux City, Iowa, and 53 cents a barrel to Sioux Falls, S. D., are announced in tariffs published by Great Lakes Pipe Line Co. for its new extension to the two cities. The lines, together with terminals at Sioux Falls and Sioux City, are now in operation.

RFC Negotiating Big-Inch Maintenance Contract

WASHINGTON. — The Reconstruction Finance Corp. is negotiating a contract with Williams Brothers of Tulsa to take custodial charge of the big-inch lines of War Emergency Pipelines, and maintain them in standby condition until further disposition is decided by the government. As of the first of the week a definite contract had not been signed.

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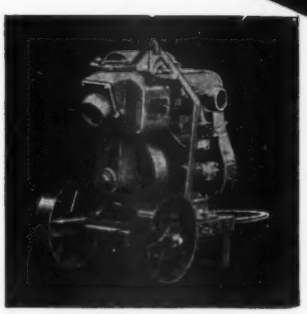

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STATISTICS and

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JANUARY 26, 1946

	Total of all wells					Cum. to date		Wildcat completions and discoveries					Cumulative total, 1946				
	Comp.	Oil	Gas	Dry	Footage	1946	1945	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	34	17	0	°17	56,900	117	110	0	0	0	0	0	0	0	0	0	0
Pennsylvania	76	37	5	†34	126,212	289	205	0	0	0	0	0	0	0	0	0	0
West Virginia	11	3	7	1	29,843	44	68	0	0	0	0	0	0	0	0	0	0
Ohio	21	7	10	4	53,219	65	51	0	0	0	1	1	0	0	2	5	7
Indiana	3	0	0	3	7,172	23	17	0	0	0	3	3	0	0	0	4	4
Kentucky	6	3	1	2	20,663	33	26	0	0	0	0	0	0	0	0	5	5
Illinois	46	31	0	15	103,246	154	155	1	0	0	9	10	3	0	0	32	35
Michigan	21	8	0	13	45,547	53	57	0	0	0	12	12	0	0	0	18	18
Kansas	30	13	4	‡19	129,543	171	101	0	0	0	7	7	1	0	0	27	28
Neb., Mo., Iowa	0	0	0	0	0	1	6	0	0	0	0	0	0	0	0	1	1
Oklahoma	45	24	5	16	179,577	189	178	3	0	2	10	15	7	0	2	34	43
Texas	130	75	9	46	551,692	513	497	2	0	0	17	19	9	0	2	88	99
North Central	48	26	1	21	155,989	225	149	1	0	0	6	7	3	0	0	27	30
West	35	22	1	12	140,234	132	122	0	0	0	5	5	3	0	0	14	17
Panhandle	6	2	3	1	18,928	28	40	0	0	0	0	0	0	0	0	1	1
Eastern	16	7	4	5	92,465	60	20	1	0	0	4	5	1	0	0	12	13
Gulf Coast	19	12	0	7	123,101	134	121	0	0	0	2	2	1	0	0	23	24
Southwest	6	6	0	0	20,975	34	45	0	0	0	0	0	1	0	2	11	14
Louisiana	26	17	5	4	158,803	85	71	0	1	0	0	1	8	1	0	7	16
Northern	15	10	3	2	65,527	40	23	0	0	0	0	0	2	0	0	4	6
Southern	11	7	2	2	93,276	45	48	0	1	0	0	1	6	1	0	3	10
Arkansas	3	1	0	2	20,638	9	14	0	0	0	0	0	0	0	0	1	1
Mississippi	7	5	0	2	57,566	19	22	0	0	0	2	2	0	0	0	4	4
Southeastern States	1	0	0	1	5,440	°6	2	0	0	0	1	1	0	0	0	5	5
Montana	7	5	1	1	14,980	22	23	0	0	0	1	1	0	0	0	1	1
Wyoming	6	4	0	2	25,362	13	20	1	0	0	2	3	1	0	2	4	7
Colorado	1	1	0	0	6,478	10	4	0	0	0	0	0	0	0	0	1	1
New Mexico	13	9	1	3	47,182	36	38	0	0	0	2	2	0	0	0	3	3
California	35	25	2	8	138,331	141	192	0	0	0	6	6	0	0	1	19	20
Total United States	528	285	50	193	1,778,394	2,093	1,857	7	1	2	73	83	29	1	9	259	298
Total previous week	569	314	46	209	2,031,625	1,575	1,367	9	0	2	78	89	22	0	7	186	215
Total Jan. 27, 1945	490	254	60	176	1,784,364	1,857	1,346	10	0	3	54	67	41	0	9	268	318

Service wells included: °17, †33, ‡1.

MARKET QUOTATIONS

(This service is abbreviated because most refinery products are selling at the Government's price ceilings. Quotations on other products than those shown here furnished on request. Quotations are f.o.b. plant in tank cars and in cents per gal. as of last Monday.)

REFINERY GASOLINE

Octane (A.S.T.M.)	78-80†		73-75
Mid-Continent*	6.250-6.50	5.50-5.75	
Gulf Coast	6.75	5.75-6.250	
Northeast Coast			9.875
California		6.50-7.00	

*Basic Oklahoma Group 3. †1939 C.F.R. (research method).

NATURAL GASOLINE

Grades:	26-70	18-55
Oklahoma (Group 3)	4.000	4.800
N. Texas (f.o.b. plant)	3.000	3.600
N. Louisiana (f.o.b. plant)	3.750	4.500
California	4.875	5.500

CRUDE-OIL PRICES

Representative posted schedules per bbl.	
East Texas	$1.25
Conroe	1.43
Tepetate, Louisiana, avg. grav.	1.20
Illinois Basin	1.37
Pecos County, Texas	.95
Bradford, Pennsylvania	3.00
Van. Van Zandt County, Texas	1.08

Note: Exclusive of subsidy.

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Texas	West Tex.*
18-18.9	$0.80	....	....	....
19-19.9	.84	....	$1.06	$0.70
20-20.9	.88	$0.85	1.08	.72
21-21.9	.92	.87	1.10	.74
22-22.9	.96	.89	1.12	.76
23-23.9	1.00	.91	1.14	.78
24-24.9	1.03	.93	1.16	.80
25-25.9	1.07	.95	1.18	.82
26-26.9	1.11	.97	1.20	.84
27-27.9	1.15	.99	1.22	.86
28-28.9	1.18	1.01	1.24	.88
29-29.9	1.20	1.03	1.26	.90
30-30.9	1.23	1.05	1.28	.92
31-31.9	....	1.07	1.30	.94
32-32.9	....	1.09	1.32	.96
33-33.9	....	1.11	1.34	.98
34-34.9	....	1.13	1.36	1.00
35-35.9	....	1.15	1.38	1.02
36-36.9	....	1.17	1.40	1.04
37-37.9	....	1.19	1.42	1.06
38-38.9	....	1.21	1.44	1.08
39-39.9	....	1.23	1.46	1.10
40 and above	....	1.25	1.48	1.12

*Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT

Week ended January 19, 1946
(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks: Gasoline	Distillate	Residual
East Coast	771	21,235	9,174	5,770
Appalachian	143	4,102	616	453
Ill., Ind., Ky.	709	20,841	4,625	2,452
Okla., Kan., Mo.	380	9,405	1,616	1,026
Inland Texas	222	2,791	341	691
Tex. Gulf Coast	1,132	16,946	5,405	4,890
La. Gulf Coast	303	5,215	1,991	1,237
N. La., Ark.	57	2,100	420	266
Rocky Mtn.	129	2,066	424	734
California	781	16,077	6,791	23,038
Total 1-19-46	4,627	100,778	31,403	40,557
Total 1-12-46	4,498	°99,287	33,359	40,499
Total 1-20-45	4,696	89,670	34,090	52,173

°Revised.

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended:	Bbl. of crude*
January 19, 1946	219,709,000
January 12, 1946	219,219,000
January 20, 1945	221,646,000

*Excludes unrefinable Calif. stocks.

TRENDS

DAILY AVERAGE PRODUCTION FOR WEEK

	Jan. 26 crude oil	Bureau of Mines demand forecast	Jan. 19 crude oil
Alabama	650	400	600
Arkansas	76,850	76,000	77,500
California	837,500	832,000	845,750
Colorado	22,150	20,000	21,500
Eastern	63,300	63,200	66,200
Florida	100	100	100
Illinois	206,500	206,100	204,300
Indiana	14,700	13,000	14,100
Kansas	254,450	260,000	261,500
Kentucky	29,700	28,500	28,900
Louisiana	368,750	365,000	368,800
North Louisiana	79,900	.....	79,950
South Louisiana	288,850	.....	288,850
Michigan	46,750	46,000	47,150
Mississippi	54,300	48,000	56,600
Montana	22,000	21,000	22,050
Nebraska	750	800	750
New Mexico	100,350	98,000	100,350
Oklahoma	392,650	382,000	391,850
Texas	2,000,800	1,950,000	2,000,800
East Texas	320,000	.....	320,000
East Central Texas	140,050	.....	140,050
North Central Texas	152,800	.....	152,800
Texas Panhandle	81,000	.....	81,000
West Texas	489,300	.....	489,300
Southwest Texas	328,900	.....	328,900
Texas Gulf Coast	488,750	.....	488,750
Wyoming	92,200	90,000	84,900
Total United States	4,584,450	4,500,000	4,570,350
Change from prev. week, up	14,100		

Total production January 1-January 26, 1946..... 127,929,900 bbl.
Same period last year ..... 122,488,350 bbl.

CRUDE-OIL STOCKS 219,709,000 bbl. as of Jan. 19—up 490,000 bbl. One year ago 221,646,000 bbl.

GASOLINE STOCKS 100,778,000 bbl. as of Jan. 19—up 1,511,000 bbl. One year ago 89,670,000 bbl.

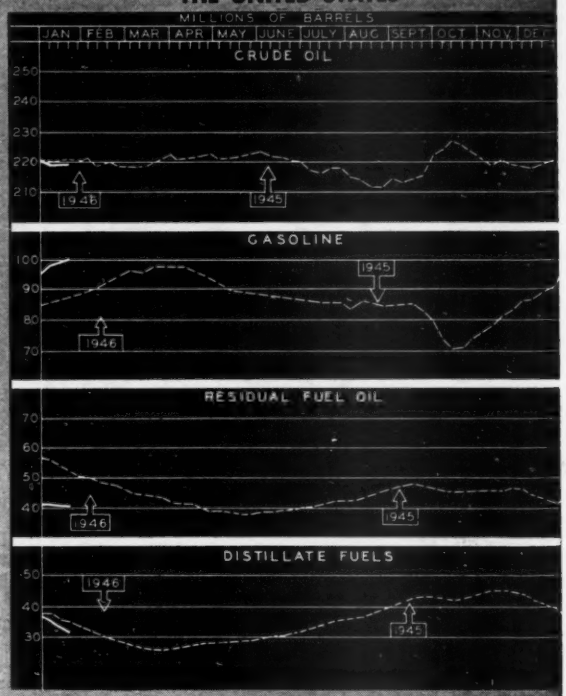
RESIDUAL FUEL-OIL STOCKS 40,557,000 bbl. as of Jan. 19—up 58,000 bbl. One year ago 52,173,000 bbl.

GAS OIL AND DISTILLATE STOCKS 31,403,000 bbl. as of Jan. 19—down 1,956,000 bbl. One year ago 34,090,000 bbl.

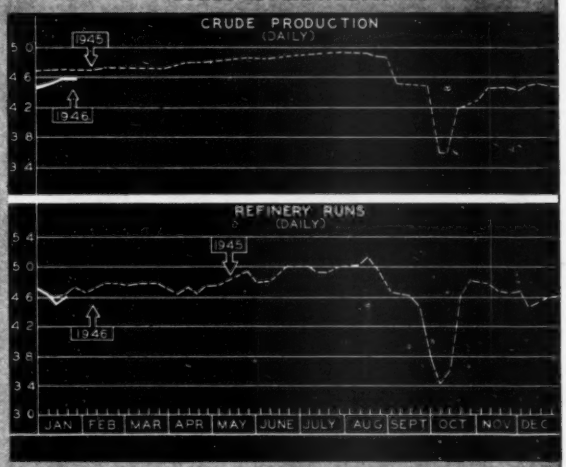
CRUDE-OIL PRODUCTION 4,584,450 bbl. as of Jan. 26—up 14,100 bbl. One year ago 4,736,700 bbl.

REFINERY RUNS 4,627,000 bbl. daily week ended Jan. 19—up 129,000 bbl. One year ago 4,696,000 bbl.

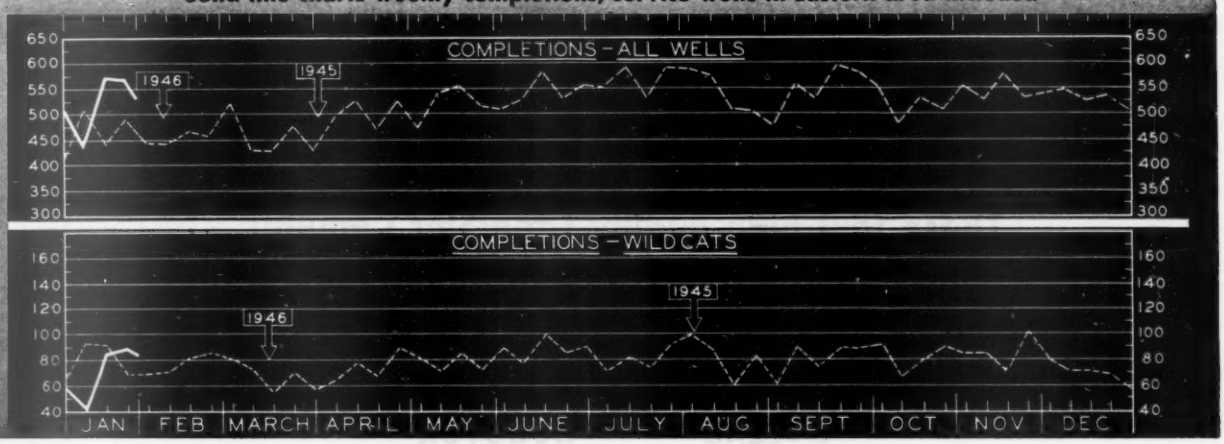
OIL STOCKS IN THE UNITED STATES



DAILY OPERATIONS



Solid line charts weekly completions, service wells in Eastern area included



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Exploration and Drilling

Oil Rumors in South Dakota

UNCONFIRMED reports that R. L. Hollingsworth et al's wildcat in Section 23-8s-2e, Fall River County, South Dakota, had some shows of oil, aroused a certain amount of skeptical interest this week. At least it was sufficient to cause a scurry of attempts to get scouts on the job to check details.

The reports indicated that the well had some stained cuttings, possibly some shows of oil and gas in sands that are probably in the Minnelusa section of the Pennsylvanian. Old-time geologists familiar with the country and with tests drilled in the region at various times over the past 20 to 25 years, maintained a general attitude of "possibly exactly true, but I'll wait until some actual production is obtained before getting excited."

The reports are that a sand zone at 2,195 to 2,223 ft. had a show of oil and water; that a second sand zone at 2,295 to 2,330 ft. had a show of oil and gas, and that in a third sand zone from 2,396 to 2,484 ft., there were two shows of oil, one at 2,430-50 ft., and the other at 2,455-84 ft. These sands check geologically with the Minnelusa section of the Pennsylvanian, judging from the depth, and sample examinations from wells drilled not far distant. They are probably equivalent in geological age to the sands producing in the Lance Creek field in Niobrara County, Wyoming.

Interest in the Black Hills area and adjacent regions is old. Many geologists have had a high regard for the general region as potential oil-producing territory for many years. Amerada Petroleum Corp. has finished five wildcat tests, all dry unfortunately, in this region within the past 12 months. Three were in South Dakota and two were in Nebraska. The nearest of these tests was about 50 miles from the test that is now arousing interest.

One reason for the skeptical attitude of many geologists toward the present excitement is that other wells drilled in this region have had shows of oil, and some have had free black oil in the hole, but none ever made a well. These shows and free oil are not uncommon in the Minnelusa section of the Pennsylvanian, and that of course is where the present reports indicate showings.

Production and completion tables formerly appearing in this section of the Journal are now published with other statistical data. In this issue the statistical trend information is published on pages 104-105.

The Hollingsworth test is on the south end of the Black Hills Uplift, where it plunges fairly sharply, at least by contrast with the north end of the uplift. It is fairly close in to the main Black Hills topographic highs, probably lying reasonably close to the foothills. It is an area where, structurally, local plunging noses are to be expected, coming off the uplift.

Past disappointments in the area cause those who know most about the region to be cautious; nevertheless many still believe it will be oil territory some day, and the Hollingsworth test could be the discovery.

PERMIAN BASIN

New Pool in Dawson County Opened by Seaboard Well

MIDLAND.—A new oil pool has been opened in eastern Dawson County, 11 miles southeast of Lamesa, 3⅝ miles west of the Borden County line, by Seaboard Oil Corp. 1 S. E. Lea, Section 47, Block 34, T-5-N, T&P Survey. It was completed to pump 176 bbl. of fluid daily, 95 per cent oil and 5 per cent basic sediment. Oil tested 32.3° gravity. Pay was topped at 3,730 ft. in the San Andres. Total depth is 3,795 ft. Seaboard's 2 Spraberry, Section 28, Block 34, T-5-N, T&P Survey, north offset to 1 Lea, was drilling below 3,574 ft. in anhydrite and dolomite.

Phillips Petroleum Co. 1 Eidson (Scharbauer), Section 25, Block B-15, Public School Land Survey, ¾ mile west of the north end of the Penwell pool, in southern Ector County, has opened a new producing zone for the field, approximately 1,000 ft. below the regular pay. On a 65-minute drill-stem test at 4,342-4,648 ft. in the Glorietta, there was a slight blow of gas in 45 minutes. Packer failed in 60 minutes. Recovery was 85 ft. of oil and 135 ft. of drilling mud. Glorietta was topped at 4,420 ft. Operator is preparing to deepen.

The Texas Co. 29 W. E. Connell, Section 9, Block B-16, Public School Land Survey, 2 miles southwest of Phillips 1 Eidson, has been plugged back to 4,702 ft. to test the Glorietta at 4,590-4,670 ft. This test had failed in the Devonian and Clear Fork. Total depth is 9,675 ft.

Texas 1-D Fraser, Section 27, Block 45, T-1-S, T&P Survey, east extension to the TXL-Ellenburger pool, Ector County, perforated 5½-in. casing at 10,790-10,890 ft., and the well flowed 435 bbl. of fluid in 5¾ hours, 3 per cent basic sediment with no water. Gas volume was 1,760,000 cu. ft. Oil tested 42° gravity.

Stanolind 3-Q Scharbauer, Section 12, Block A, Public School Land Survey, wildcat on the north end of the Goldsmith pool, Ector County, plugged back to 6,330 ft. from total depth of 9,155 ft. and is shut down for orders. Stanolind 1 Kayser, Section 34, Block 43, T-2-S, T&P Survey, deep test on the southwest edge of the old Adams pool of Ector County, showing porosity in samples from 9,280-9,450 ft., ran a 65-minute drill-stem test at 9,265-9,450 ft. Recovery was 510 ft. of drilling mud and 1,890 ft. of salt water. Operator is preparing to deepen.

Shell Oil Co., Inc. 1 A. Nelson, Section 8, Block A-40, Public School Land Survey, wildcat in the extreme west central portion of Andrews County, ran a 35-minute drill-stem test at 8,211-58 ft. Recovery was 40 stands of drilling mud and 41 stands of sulfur water. It is being drilled deeper. Skelly Oil Co. 1-Z University, Section 10, Block 11, University Survey, 10,000-ft. wildcat 2 miles west of the Embar pool, Andrews County, took a 6-minute drill-stem test at 4,376-4,430 ft. and recovered 90 ft. of oil and gas-cut mud. It is drilling ahead.

Funk field, Tom Green County, had six completions during the week. Garza field, Garza County, and Pecos Valley High Gravity pool, Pecos County, each had three. Keystone-Ellenburger field, Winkler County, has 37 drilling wells; TXL field, Ector County, 32; Fullerton field, Andrews County, 29; Block 31 field, Crane County, 18; and Welch field, Dawson County, 10. Garza field had four locations, Slaughter field, Cochran and Terry counties, and Keystone-Ellenburger each had three.

WEST TEXAS WILDCAT FAILURES

Coke County: Warren Pet. 1 R. B. Kirk, Sec. 309, J. Johnson Sur., 1¼ mi. S Blackwell, elev. 2,023 ft., Ellenburger 6,338 ft., dry, TD 6,552 ft.

Concho County: Eltex 1 Mrs. Julia Melinger, Sec. 1, GC&SF Sur. A-1360, elev. 1,962 ft., dry, TD 4,401 ft.

Crane County: Humble 1 G. H. Cowden et al, Sec. 35, Blk. X, CCSD&RGNG Sur., 7 mi. SW crane, elev. 2,530 ft., Devonian 6,085 ft., Silurian 6,330 ft., Ellenburger 8,710 ft., dry, TD 9,460 ft.

Fisher County: Harley Sadler 1 Earl Whitaker, Sec. 7, Blk. 21, T&P Sur., 13 mi. S Roby, elev. 2,194 ft., dry in Flippen, TD 2,961 ft.

Garza County: Lanier Meredith Oil Co. 1 Slaughter, Sec. 29, Blk. 1, Jasper Hays Sur., 4 mi. S Post, elev. 2,874 ft., dry in San Andres, TD 3,453 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Mid-Continent Petroleum Corp. 1 Christmas, 17-23s-37e, 1¼ miles southwest of Ellenburger production in the Penrose-Skelly field of southeastern Lea County, ran a 125-minute drill-stem test from 6,385-6,500 ft. There was a steady blow of air

throughout the test and 800 ft. of drilling mud was recovered with the last 100 ft., slightly gas cut. Drilling continued below 6,526 ft. in the Tubb zone.

Humble Oil & Refining Co. 8 Greenwood, 9-22s-37e, south offset to the Ellenburger discovery in the Penrose-Skelly field, was completed to flow 638 bbl. of 39.7°-gravity oil in 24 hours. Gas-oil ratio was 980 to 1.

Magnolia Petroleum Co. 9 Argo-Brunson, 9-22s-37e, a northeast offset to the discovery, kicked off and flowed 125 bbl. in 2 hours through 1-in. choke after treatment with 2,000 gal. of acid. Production is through perforations from 7,656-881 ft. It was testing for completion. Humble 1 Cooper, 23-24s-36e, a depleted shallow well in the Cooper Jal field in southeastern Lea County, was drilling below 9,016 ft. in lime and shale.

Maljamar and South Eunice fields, Lea County, each reported two completions this week. Lea County has 54 drilling wells with 7 wildcats. Eddy County has 49 with 14 wildcats.

SOUTHEASTERN NEW MEXICO WILDCAT FAILURE

Eddy County: Shuster & Messinger 1 Anderson 31-19s-28e, 6 mi. NW Russell pool, elev. 3,400 ft., dry in Yates, TD 1,605 ft.

SOUTH LOUISIANA

Humble's Discovery Finds Oil Sand at 11,600 Ft.

NEW ORLEANS.—A prospective new oilfield discovery in the Little Temple area of LaFourche Parish, is Humble Oil & Refining Co. 1 Louisiana Delta Farms Co., 19-17s-23e. This test is reported to have 30 ft. of good oil sand topped around 11,600 ft. Total depth is 12,007 ft., with the 5½-in. production pipe set at 10,735 ft.

Sand showing oil saturation has been cored at Crosby Drilling Corp. and Lyle Cummins 1 Eugene Gordon, Wilcox wildcat test in the Woodside area of St. Landry Parish, in the SE SW 2-3s-6e. Wilcox was topped at 9,205 ft., and in the first core from 9,205-15 ft. recovered 10 ft. with the bottom 4 ft. being hard fine sand with good odor, and 2.85 per cent volumetric saturation. Operators have gone back in the hole to cut a core from 9,215-25 ft.

Union Oil Co. of California is still trying to complete its field opener in St. Charles Parish on the Hahnville prospect. The well, 1 Milliken and Farwell, 26-12s-20e, flowed 80 bbl. daily through perforations at 8,776-85 ft., through a ¼-in. choke. After flowing for about 24 hours the well went dead and operators are pulling tubing to reperforate for the third time. Total depth of this hole is 9,981 ft., and the 5½-in. casing is cemented at 8,897 ft. Sands showing oil saturation were picked up at 8,770-86 ft.

Union Oil Co. 2-D F. H. Gray subdivision, 33-10s-12w, at Vinton field in Calcasieu Parish, gaged 135 bbl. daily of 32° gravity oil through a 9/64-in. choke with 650-lb. pressure on tubing and 750 lb. on the casing, along with 51,000 cu. ft. of gas. Production is from open hole at 5,118-32 ft. Total depth is 5,132 ft., and 5½-in. casing cemented at 5,118 ft.

At Bayou Blue in Iberville Parish, Crosby Drilling Corp. and R. J. St. Germain et al 1 Wilbert & Adams Royalty Co. 66-9s-11e, is drilling ahead in sidetracked hole below 6,500 ft. The well went into salt at 7,325 ft., and bottomed at 7,335 ft. in salt before plugging back to 6,400 ft. and sidetracking.

Ten new locations were reported this week, two being wildcats, one each in Assumption and Beauregard parishes. One new sand was reported in Lafayette Parish which was the only exploratory activity this week. All the additional 10 completions are in proven areas with Bayou Sale leading with two producers reported.

SOUTH LOUISIANA SUCCESSFUL WILDCAT

Lafayette Parish: New pay North Cankton field—Shell 1 Breaux-Kilchrist Unit, 65-8s-4e, top sand 10,916 ft., TD 11,101 ft., perf. 10,916-66 ft., PT 55 bbl. 24 hours through 7/64-in. choke, gas-oil ratio 17,200 to 1, TP 3,550 lb., gravity 54°, no water.

TEXAS GULF COAST

Texas Co.'s Wharton County Well Making Flow Tests

HOUSTON.—The Texas Co. 120-C Pierce estate, link well between the Lane City and Withers fields of Wharton County, William Pettus League, ½ mile east of Withers production and just across the Colorado River from Lane City production, is making a series of flow tests from open hole below the 5½-in. casing between 5,382-5,420 ft., total depth. On a 13/64-in. choke the well flowed 85 bbl. of oil and is continuing to test. The company is rigging up to drill the 121-C Pierce estate, 933 ft. west of this test. It will be drilled to 6,500 ft.

Ohio Oil Co. 1 Kirby Lumber Corp., wildcat test 6 miles east of Cleveland in Liberty County, James McCoy League, is coring ahead from 9,670 ft. in sandy shale with no further shows encountered since passing sands showing gas and condensate between 9,107-22 ft. A drill-stem test between 9,107-117 ft. made recovery which indicated possible production for gas and condensate.

Three miles west of Glendale in Trinity County, Magnolia Petroleum Co. 2 Bolton, wildcat test in Henry Bond League, Abstract 75, squeezed perforations at 10,500-60 ft. where a drill-stem test showed an estimated flow of 500,000 cu. ft. of gas daily. Operators are now drilling out cement to go deeper and test the Rodessa section. Total depth is 12,505 ft. and the 7-in. pipe is cemented at 10,642 ft.

Magnolia 3 Warren Ranch, confirmation test at Hockley field in Harris County, Joshua Hudson Survey, southeast of the 2 Warren Ranch discovery well, is drilling ahead from 6,086 ft. in shale after making a drill-stem test at 5,970-80 ft., recovering 900 ft. of oil and 200 ft. of salt water in 1 hour through ¼-in. chokes top and bottom.

Houston Oil Co. of Texas and American Republics Corp. 18 fee, deep test on the south flank of Ariola field, Hardin County, Edward Ariola Survey, 3,150 ft. from nearest production, showed salt water on another test. Perforations were made at 7,487-91 ft., and in 2½ hours using ¼-in. and ⅜-in. chokes, it recovered 32 stands of fresh water, 4 stands of mud, 3 stands of mud cut with salt water, and 23 stands of salt water with a slight show of oil. Perforations were squeezed, and another squeeze job was made through a new set of perforations from 7,450-55 ft.

Another well has been completed in the Cockfield sands, northwest of Wilcox production in Cold Springs field in San Jacinto County. It is Butcher-Arthur, Inc. 1-B W. C. Childress, in W. M. Logan Survey, about 1,000 ft. northeast of the 1 Dodson Cockfield discovery well for the area. A gage of 171 bbl. of 43° gravity oil daily through a 10/64-in. choke is reported. Total depth is 5,620 ft., with 5½-in. casing at 5,616 ft., perforations at 4,470-4,500 ft. for completion.

On the north flank of Sandy Point field, Brazoria County, the Crown Central Petroleum Corp. 1 J. A. Fite, David Talley Survey 12, has been plugged as a dry hole after picking up only a few slight shows of oil and a recovery of salt water on a drill-stem test. Total depth is 8,507 ft. The well was cored from 5,540-7,725 ft. with only a few slight shows of oil in cores at intervals at 6,445-6,655 ft. A drill-stem test made at 6,446-50 ft. recovered 650 ft. of salt water with very low top pressure and a bottom-hole pressure of 3,150 lb.

Humble Oil & Refining Co. 1 North Delhi Gas Unit 1, second test in the newly discovered North Delhi area, Harris County, has been plugged as a dry hole with total depth of 7,600 ft. Cement plugs were set at 6,980 and 2,470 ft. This test was 2,300 ft. southeast of the Josey and Bruton 1 David Rorick discovery well.

Monday Oil Co. 1 Mary Hillman, wildcat in the Joseph Rector Survey, Jackson County, is dry with total depth 7,002 ft., no shows of interest reported.

There were 24 new locations reported this week with 6 being wildcats, 3 in Matagorda, and 1 each in Fort Bend, Jefferson, and Tyler counties. Six of the 11 completions are producers, with Harris County taking the lead with 2 producers and 1 dry hole. Two of the dry holes were wildcats, one each in Chambers and Harris counties.

UPPER GULF COAST WILDCAT FAILURES

Chambers County: Standard of Texas 1 State-Galveston Bay, Sec. 103, dry, TD 8,198 ft.

Harris County: Humble 1 North Delhi Gas Unit 1, North Delhi area, George Spencer Sur., Abst. 1369, dry, TD 7,600 ft.

APPALACHIAN FIELD

Sycamore's Wildcat Gages 1,055,000 Cu. Ft. of Gas

PITTSBURGH.—In Ripley district, Jackson County, West Virginia, Sycamore Gas Co. shot the wildcat on the Susie Sycamore farm and it gaged 189,000 cu. ft. of gas from the Oriskany sand, natural, after which it gaged 1,055,000 cu. ft. with a rock pressure of 1,875 lb. in 24 hours. With a surface elevation of 594 ft., the Corniferous lime was logged at 4,674 ft. and the Oriskany at 4,774-4,811 ft. The shot was at 4,797-4,808 ft. Total depth is 4,838 ft.

In Cabin Creek district, Kanawha County, Virginian Gasoline & Oil Corp. completed an extension of Imperial Coal Co. No. V1372 good for 30 bbl. a day from the Weir sand. Total depth is 3,291 ft.

In Lincoln County, United Fuel Gas Co. completed No. 5,666 Huntington Development & Gas Co. in Jefferson district with a gage of 3,499,000 cu. ft. of gas from the Big Lime. Total depth is 1,891 ft.

In the Oriskany extension in Elk district, Kanawha County, United Fuel topped the Corniferous lime at 4,890 ft. in the test on 5,704 the Nancy E. Myers farm and is running casing to 4,910 ft. United Carbon Co. topped the Oriskany at 5,200 ft. in the test on Charleston National Bank and at 5,222 ft. no gas pay had been reached.

In Tucker County, the important wildcat of Ohio Oil Co. on Kuykendall Unit, Dry Fork district, resumed drilling, reached 8,365 ft. and shut down to run a string of 7-in. casing.

During the week five new locations were announced, located in McComas district, Cabell County; Elk district, Kanawha County; Washington district, Lincoln County; Hardee district, Mingo County; Baileysville district, Wyoming County.

In southwest Pennsylvania 12 new locations were scattered in Burrell, Cowanshannock, and Kittanning townships, Armstrong County; Jefferson Township, Greene County; Armstrong and Washington townships, Indiana County; Morris Township, Washington County; Bell and Washington townships, Westmoreland County.

In Kittanning Township, Armstrong County, Boyd & Schupp completed a gas well in a test on the James Dunbar farm good for 941,000 cu. ft. from the Thirty-Foot sand. Total depth is 1,516 ft.

In North Strabane Township, Washington County, the test of Charles E. Young on the Harry Hatfield farm, after a showing

of oil in the Gantz sand, drilled through the Gordon sand, which was broken, and had only a showing of gas. It is now drilling in the Fourth sand, which is limy. Young's test on the White Turkey farm, to the northeast, recovered tools stuck in the Fourth sand and is drilling ahead to the Fifth.

SOUTHWEST TEXAS

Gas-Condensate Well Opens New Sand at Los Indios

CORPUS CHRISTI.—A new sand for Los Indios field has been opened by Baldridge & King 2 W. L. Goldston, in Santa Anita Grant, Hidalgo County. This well showed for a gas-condensate producer at 6,030-58 ft. and was shut in. Total depth is 8,449 ft. with 5½-in. casing set to 6,987 ft.

In the Rincon field extension area, Starr County, The Harrus Syndicate 2-A Garcia, Block 14, Porcion 90, was completed, flowing 128 bbl. per day through a ⅛-in. choke from pay topped at 3,310 ft. Total depth is 3,560 ft. Tubing pressure is 250 lb., casing pressure 650 lb., gravity 44°, no water. Gas-oil ratio is 350 to 1.

Mills Bennett 1 Martha Berger et al, wildcat that has indicated gas-condensate production in the Slick and Luling zones and which is located 2 miles southwest of Tuleta in Bee County, is drilling ahead from 8,658 ft. after running log to 8,575 ft. Operators plan to drill ahead now to about 8,850 ft. after which liner will be set for completion attempt.

Quintana Petroleum Corp. 1 O. Muil, wildcat in J. M. Mattison Survey 467, about 11 miles southeast of Pleasanton in Atascosa County, is testing 100 ft. of open hole below the 5½-in. casing and is flowing an ungaged amount of gas and condensate through a ⅛-in. choke. Pay is reported in upper part of Edwards lime. Total depth is 9,105 ft. with 5½-in. production casing set to 8,836 ft.

In the Berclair area of Bee County, Magnolia Petroleum Co. 1 E. H. Buckner, in Thomas Simmons Survey, is retesting. This wildcat had been called the discovery well of the Berclair field after flowing gas-condensate through perforations at 10,020-150 ft. but was later temporarily abandoned. Operators recently went back into the hole, set packer at 10,022 ft. and the well now is flowing gas-condensate through a ⅛-in. choke on a new test with 5,100-lb. pressure. No gage of the flow is available. Total depth of the hole is 10,561 ft. in the Wilcox. The Carrizo sand was topped at 9,820 ft. This wildcat also made gas and condensate through perforations at 10,370-404 ft.

Humble Oil & Refining Co. 1 Vick et al, wildcat in the Tanglewood area, Lee County, is waiting on cement to set after re-squeezing in perforations 6,060-75 ft. It flowed 100 bbl. per day of fluid 1 per cent oil through these perforations using 3/16-in. choke with 1,080,000 cu. ft. gas daily. Tubing pressure 1,725 lb.

The 19 new locations include five wildcats, located two in Live Oak, one each in Duval, Jim Hogg, and Willacy counties. Willamar field received the greatest number of new locations with four reported. Only two wildcats were completed this week, both dry, one each in Live Oak and San Patricio counties. The remaining 12 completions are in proven areas with only one completion to each field. Duval County led with two producers.

SOUTHWEST TEXAS WILDCAT FAILURES

Live Oak County: Smith-Story-Wood Corp. 1 F. E. Pace, E. Ramirez Survey, dry, TD 4,251 ft.

San Patricio County: Homer Easterwood et al 1 Leola M. Cage, dry, TD 6,508 ft.

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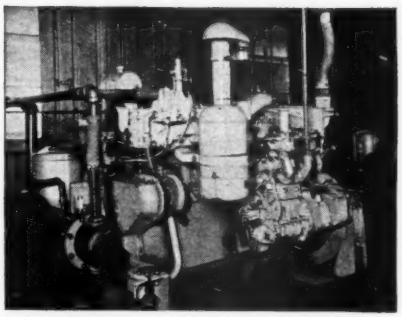

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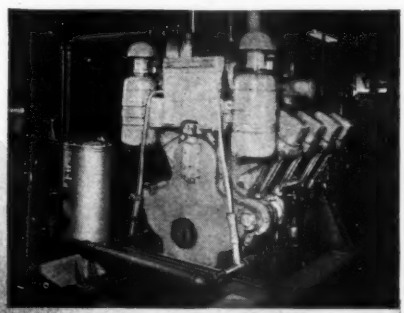

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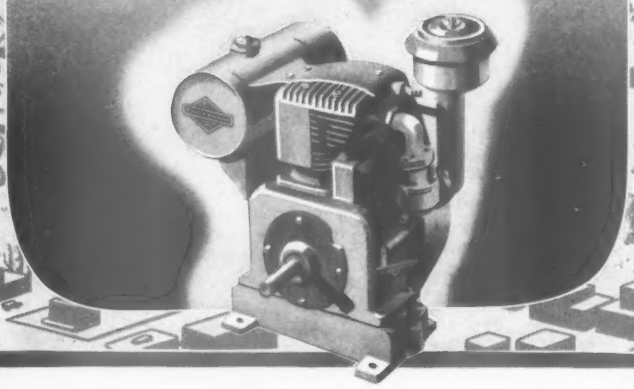

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N. CENTRAL TEXAS

King County Wildcat Finds Oil Signs at 6,120-94 Ft.

WICHITA FALLS.—Superior Oil Co. 1 Pitchfork Land & Cattle Co., Block 171, John H. Gibson Survey, wildcat 12 miles northwest of Guthrie in western King County, drilled lime with stains and odor of oil at 6,120-70 ft. and shale with lime streaks at 6,170-94 ft. On a 30-minute drill-stem test at 6,100-94 ft. 1,260 ft. of heavily gas-cut drilling mud and 3,200 ft. of salt water were recovered. The test was drilling below 6,950 ft. in chert. Standard Oil Co. of Texas 1 Mitchell, J. B. McNair Survey, 10,000-ft. wildcat 1½ miles northwest of Sherman in northern Grayson County, had progressed to 4,553 ft. in shale.

Continental Oil Co. 1 Jarrell, Block 3433, TE&L Survey, wildcat 5 miles southwest of Bowie, Montague County, swabbed 28 bbl. of fluid in 8 hours, 26 bbl. of which was water and 2 bbl. oil, through perforations at 5,700-15 ft. in the Caddo. Oil and gas increased slightly during the last 2 hours of the test. On a later 24-hour test, 20 bbl. of water with no oil was recovered. The operator was preparing to treat this zone with 2,000 gal. of acid. S. D. Johnson 1 Rich, W. S. Harkin Survey, wildcat 3 miles northwest of Belcherville, Montague County, is dry in the Ellenburger at 6,033 ft.

National Associated Petroleum Co. 1 Proud, Block 189, Waggoner Colony Subdivision, wildcat 5 miles north of Electra, Wichita County, recovered 5 ft. of free oil and 25 ft. of heavily oil-cut drilling mud on a 1-hour drill-stem test of the Ellenburger at 4,496-4,517 ft. Another 1-hour drill-stem test at 4,497-4,520 ft. recovered 4 ft. of free oil and 36 ft. of oil-cut mud. Casing has been cemented at 4,501 ft. for completion attempt.

Electra field, Wichita County, had six completions during the week and Hildreth field, Montague County, three. Electra field had five locations, and KMA field, Wichita County, had three. Sivells Bend field, Cooke County, has 10 drilling wells; Cooper field, Archer County 6; Hildreth field, Montague County, 8; and National field, Wilbarger County, 6.

In West Central Texas, Shackelford County Regular field, had three completions during the week. This field also had two locations. Stephens County Regular field has six drilling wells, Loving field, Stephens County, two, and eight wildcats are drilling in Stephens. Jones County had 13 drilling wells, three in Jones County Regular field, two in Noodle field, and eight wildcats. Eastland County had three wildcats drilling, and Cisco field has four.

NORTH CENTRAL TEXAS SUCCESSFUL WILDCAT

Montague County: Extension to old pool—S. D. Johnson 1 Crenshaw Est., W. Wallace Sur., 1½ mi. NW Belcherville pool, elev. 933 ft., IP 72 bbl. daily, perf. 5,550-65 ft. Bend, gravity 43, TD 5,719 ft.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Archer County: Bridwell Oil Co. 1 W. P. Ferguson, Blk. 11, KWVFL Sur., 3 mi. N and 1 mi. W Mankins, dry, TD 1,880 ft.

Clay County: Fortex Oil Corp. et al 1 G. E. Myers, Blk. 48, Bacon Subd. of E. Story Sur. A-419, 5½ mi. W Petrolia, dry, TD 1,435 ft.

Montague County: NuEnamel Oil Oper. Co. 1-B Will Laird, R. T. Millard Sur. A-470, 7 mi. S Bowie, elev. 984 ft., Bend 5,750 ft., dry, TD 6,888 ft.

A. R. Dillard et al 1 Walker, Sec. 17, Limestone CSL Sur., 1 mi. N Stoneburg, elev. 926 ft., Barnett 6,277 ft., dry, TD 6,305 ft.

Wilbarger County: Fred Manning, Inc. 1 Albert Graf, Sec. 33, Blk. 9, H&TC Sur.,

6 mi. S and 3½ mi. W Vernon, elev. 1,290 ft., dry, TD 6,002 ft.

Young County: Reno Oil Co. and Chas. E. Morrison 1 R. J. Robertson, S. Barrick Sur. A-1975, 3½ mi. N and 1½ mi. E Graham, elev. 1,221 ft., Barnett 4,745 ft., Mississippian 4,835 ft., dry, TD 5,030 ft.

WEST CENTRAL TEXAS WILDCAT FAILURE

Coleman County: Fulwiler & Hughes Drlg. Co. 1 Lottie Cope, EL&RR Sur., 1½ mi. W Silver, elev. 1,987 ft., Caddo 3,710 ft., dry, TD 3,765 ft.

MICHIGAN

Sixty-Sixth Deep River Producer Extends Pool

SAGINAW.—The sixty-sixth well in the Deep River-Arenac oil field extended the pool southeast, making it now 5 miles long, ½ mile wide, as Mason Halloway of Saginaw brought in a producer at between 250 and 300 bbl. an hour. Ervin Major 2 Charchan, Section 23, also came in for 300 bbl. an hour.

Twelve of the week's 21 completions were wildcat tests, all dry holes. Only four new locations were announced, two in Ottawa County, one in Van Buren, one in Montcalm. Recovery from the week's eight oil completions ranged downward to 9 bbl. a day after acid from Muskegon Development Co. 1 Stottle, Section 29, Foster Township, Ogemaw County, drilled to 4,179 ft., deepest of the week.

Arthur E. Williams 1 Krahl in Section 15, Elba Township, Gratiot County, went in the records for 70 bbl. a day, pinched, in natural flow. That successful venture assured a revival of drilling in Gratiot County. Another Central Michigan test that was promising for a time petered out when the E. E. Brehm 1 Skorina, in Vassar Township, Tuscola County, was dry. Acidizing resulted in recovery of a few barrels of oil, but there was too much salt water.

Michigan Oil & Gas Association statistics show the Adams and Deep River fields in Arenac County on the heels of the Reed City pool as the state's chief production area. But output continues to drop slowly, now averaging 44,245 bbl. a day from 3,521 wells. Arenac led in development last year with 115 drilling permits out of the state total of 755. Allegan and Isabella each had 73, Mecosta 57, Van Buren 46, Osceola 42, Bay 40, Montcalm 39, Ottawa 38, Clare 33.

MICHIGAN WILDCAT FAILURES

Allegan County, Casco Township: J. E. Hood 1 Kerr, SE NW NW 20-1n-16w, dry in Traverse limestone, TD 1,325 ft.

Overisel Township: H. C. Nelson 1 Kolk, NE SW NE 5-4n-14w, dry in Traverse limestone, TD 1,534 ft.

Berrien County, Benton Township: Sewage Sanitation Co. 1 City of David-Eastman Springs, NE SE SW 20-3s-18w, dry in Monroe formation, TD 895 ft.

Kent County, Plainfield Township: S. L. McCall 1 Petersen, NE SE SE 1-8n-11w, dry in Traverse limestone, TD 2,267 ft.

Livingston County, Howell Township: Alpha Oil Co. 1 Harris, NE SE NE 25-3n-4e, dry in Dundee, TD 1,029 ft.

Genoa Township: Alpha Oil 1 Itsell, W½ SE SE 5-2n-5e, dry, TD 371 ft.

Montcalm County, Crystal Township: Allegan Pipe & Supply 1 Davis, NW NW NW 36-10n-5w, dry in Dundee, TD 3,257 ft.

H. E. Bell 1 Eldridge, NE NE NE 21-10n-5w, dry in Dundee, TD 3,254 ft.

Bloomer Township: Sohio Petroleum 1 Tousley, NW NW NE 9-9n-5w, dry in Monroe, TD 3,281 ft.

Newaygo County, Croton Township: Wagenaar & Newman 1 Gauweiler, NE SW SE 2-12n-11w, dry in Monroe, TD 3,325 ft.

Osceola County, Hershey Township: Sun Oil-Carter Oil 1 Johnson-Cody, NE 25-17n-9w, dry, TD 1,520 ft.

Tuscola County, Vassar Township: E. Edwin Brehm 1 Skorina, NW SE SW 35-11n-8e, dry in Traverse limestone, TD 2,121 ft.

ILLINOIS

Stanford Field Yields Week's Largest Well

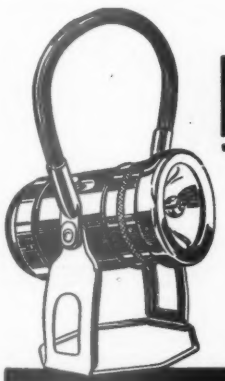
MATTOON.—Clay County continued to be the center of interest in the Illinois Basin during the past week with the successful completion of an excellent well in the Stanford pool and a new discovery well about 2 miles west of the East Tolliver field.

Phillips Petroleum Co. 1 Minnie Taylor, W½ NW NE 24-3n-7e, in the Stanford pool, was completed with the largest initial flow of any well in the state during the past few weeks. The 1 Taylor flowed 949 bbl. of oil during pre-completion tests and 792 bbl. of oil in 24 hours on initial test. It is producing from the McClosky at 2,996-3,003 ft. and 3,016-21 ft. and was acidized with 4,000 gal.

The new discovery was the W. W. Shaffer 1 Wood, SE SW SE 21-5n-6e, which pumped 146 bbl. of oil and 7 bbl. of water daily. Production was from the Cypress sand at 2,554-76 ft. following a 50-qt. shot at 2,552-77 ft. The 1 Wood opens the third new pool in Illinois so far this year. The other two new fields are also located in Clay County.

Meanwhile, Clay County's newest prospect, the Deep Rock Oil Corp. 1 Ed Given,

(Continued on page 122)



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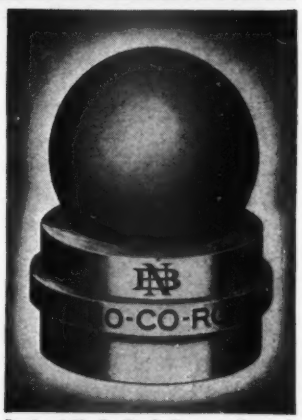

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ROBINSON · ILLINOIS

OHIO, KENTUCKY

Test May Be Opening Second Oriskany Pool

COLUMBUS.—Indications of another Oriskany pool in Columbiana County were found by Ohio Oil Co.-Galey 1 G. L. Powell, Section 22, Madison Township. Top of lime was at 4,188 ft., Oriskany sand at 4,465 ft., and total depth 4,473 ft. The well gaged 2,940,000 cu. ft. and was shut down for testing.

In the North Canton area Ed Obermiller 1 M. Gerstenslager, Section 32, Plain Township, Stark County, came in at 1,332,000 cu. ft. of gas natural from pays in the Red and White Clinton sands which were logged at 4,545-4,606 ft. Most of the drilling in the Sandyville field is now concentrated in this area.

Ohio Fuel Gas Co. 1 A. H. Campbell, Section 1, Washington Township, Holmes County, adds a good well to the lower Lakeville pool. Second Clinton sand was at 3,158-72 ft., and gaged 4,120,000 cu. ft. natural.

In the Lorain County field, Ohio Fuel 1 E. R. McConnel found 2,520,000 cu. ft. in the upper Clinton at 2,199-2,215 ft. North and east offsets to the well have been approved.

In the Somerset area, Clyde Foraker 3 M. C. Deavers, Section 10, Reading Township, Perry County, made 70 bbl. in 24 hours. Clinton sand was found at 3,115-53 ft.

Twenty locations were reported with Cambridge and Sandyville each having five. Of the 21 completions Ashland and Lancaster led with 5 each.

OHIO WILDCAT FAILURE

Summit County, Norton Township: J. C. Steiner et al 1 Harvey Fritz, Lot 21, Clinton 3,645-3,710 ft., TD 3,768 ft.

EASTERN KENTUCKY

ASHLAND.—Three gas wells, one dry, were completed in eastern Kentucky operations during the week.

Most of the activity in this field has been confined to Pike, Magoffin, Floyd, and Knott counties.

Kentucky-West Virginia Gas Co. completed Well 5589 on the Nathaniel Thacker property, Pike County, total depth 4,114 ft., daily open flow of 193,000 cu. ft. in shale, A.S.

Kentucky - West Virginia Gas Co. com-

(Continued on page 122)

EASTERN TEXAS

Possible New Pool Indicated By Harrison County Wildcat

DALLAS.—R. W. Williams 1 Furrh Estate, Frances O'Neal Survey, wildcat 3 miles northwest of Elysian Fields, Harrison County, indicated a possible new pool from the Travis Peak on a 10-minute drill-stem test at 6,290-6,305 ft. Recovery was the 1,440-ft. water cushion and 2 to 3 gal. of 40° to 45°-gravity oil. Travis Peak was topped at 6,249 ft. Total depth is 6,852 ft. Operator was running the 5½-in. casing to bottom.

Placid Oil Co. 1 Knox, Benjamin Parker Survey, 1 mile southwest of the Whelan pool in western Harrison County, is testing the Travis Peak at 8,300 ft. It will be thoroughly tested before perforating at 6,804-44 ft. in the Rodessa, the regular pay zone for the pool.

Delta Drilling Co. 1 Livingston, Nacogdoches University Survey, wildcat 3 miles southeast of Reilly Springs in southern Hopkins County, was making a little gas and fresh water through perforations at 8,005-32 ft. Placid 1 Allison, Isaac Hall Survey, on the north flank of the Carthage gas-distillate field, Panola County, gaged 7 bbl. of oil in 1 hour through ½-in. tubing choke in perforations at 6,388-6,400 ft. in the Travis Peak.

Homer Snowden and H. C. Owens 1 Southern Pine Lumber Co., Samuel Pew Survey, wildcat 12 miles northwest of Clarksville, Red River County, is dry at 2,605 ft. in the Paleozoic. H. L. Hunt 1 Carlton Robinson, John Braden Survey, wildcat 2 miles northeast of Daingerfield, Morris County, is dry at 8,430 ft. The Travis Peak was topped at 8,212 ft.

Carthage field, Panola County, reported three completions in the week. Hawkins field, Wood County, and Sand Flat field, Smith County, each had two. Carthage field had 29 active drilling wells and Jefferson field, Marion County, four. Carthage, Sand Flat, Hawkins, and Pickton field, Hopkins County each reported one new location.

EASTERN TEXAS SUCCESSFUL WILDCAT

Freestone County: Extension to old oil pool —Barney Carter (R. L. Wheelock) 1 F. E. Hill Hrs., H. Sheppard Sur., 2 mi. NE extension to Fairfield pool, elev. 406 ft., flowed 27,000,000 cu. ft. gas daily with 3 to 5 bbl. distillate per million cubic feet gas, perf. 4,174-84 ft. Woodbine, gravity 54, TD 4,500 ft.

EASTERN TEXAS WILDCAT FAILURES

Hunt County: Homer W. Snowden et al 1 V. T. Banks, Joseph Hillier Sur. A-599, 1 mi. S Weyland, elev. 571 ft., Woodbine 2,764 ft., dry, TD 2,778 ft.

Limestone County: NuEnamel 1 Eula Schulz, P. Varela Sur., 4½ mi. NW Mexia, elev. 269 ft., dry, TD 3,372 ft.

Shelby County: Hiawatha Oil & Gas 2 Pickering Lbr. Co., Wm. J. Brittain Sur., 6 mi. E and slightly N Patroon, elev. 241 ft., Austin 3,045 ft., Georgetown 3,540 ft., dry, TD 5,900 ft.

Van Zandt County: Humble 1 E. E. Lutz, J. Allison Sur., 2 mi. NW Jackson, elev. 477 ft., Travis Peak 8,185 ft., dry, TD 8,405 ft.

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2,258,614

1. The method of treating and producing an oil-water well containing a liquid column consisting at least in part of water, which method comprises establishing conditions for the production of an increased proportion of oil from the well through a treatment of the latter including delivering into the well to act upon the liquid column therein, and thereby forcing down the water, a fluid of lower specific gravity than said water, and thereafter producing the well while maintaining by the fluid contents thereof a back pressure upon the formation, the rate of production and the back pressure being correlated to maintain the desired restraint upon the water in the formation.

2. The method of treating and producing an oil-water well which contains a liquid column consisting at least in part of water, which method includes the steps of introducing into the well a fluid of lower specific gravity than the water until by the pressure so produced at least the water portion of the column is forced to a position wherein improved oil entry to the well is possible, shutting in the well for a period, and then producing the well while maintaining by the fluid contents thereof a back pressure upon the formation, the rate of production and the back pressure being correlated to hold in check the water in the formation.

2,258,615

1. In combination, in an apparatus for effecting oil delivery from an oil-water well, means for mechanically pumping such a well, means for introducing into such a well a quantity of fluid of lighter specific gravity than the mixture of oil and water therein, and means for effecting the building up of a gaseous formation pressure upon the top of the fluid so introduced to force back into the oil stratum the liquid within the well, said means for mechanically pumping the well having means for regulating the rate of effective operation thereof.

2,258,616

1. The method of treating oil-water wells which includes restoring to availability for oil delivery portions of the formation adjacent the well which have become water sealed by forcing, through the medium of a liquid of lighter specific gravity than the water, the water standing in the well into such position in the formation that there will be a reduced interference with the entry of oil into the well, then plugging off the bottom of the well by cementing, and thereafter repeating before a resumption of production the procedure utilized to restore to availability for oil delivery the portions of the formation adjacent the well which had been water sealed.

Write our Patent Department at Claremont, New Hampshire

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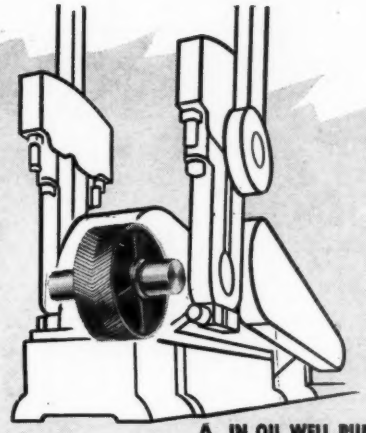
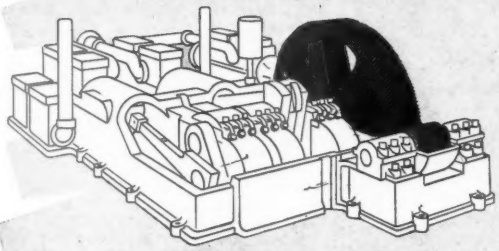
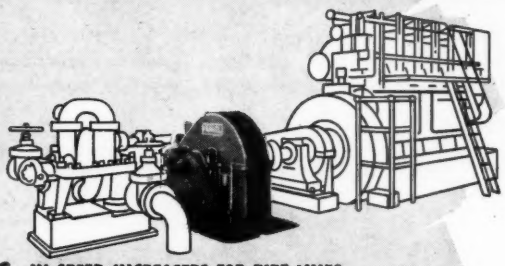


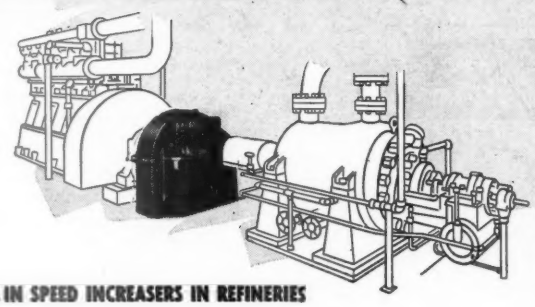
A. IN OIL WELL PUMPING UNITS



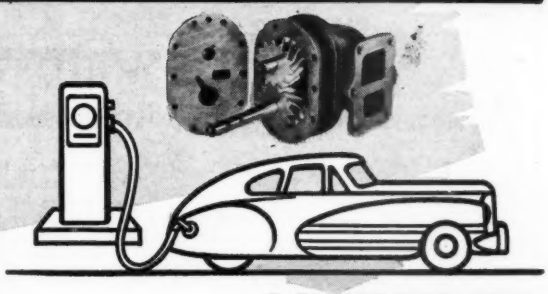
B. IN RECIPROCATING PUMPS FOR PIPE LINES AND REFINERIES



C. IN SPEED INCREASERS FOR PIPE LINES



D. IN SPEED INCREASERS IN REFINERIES



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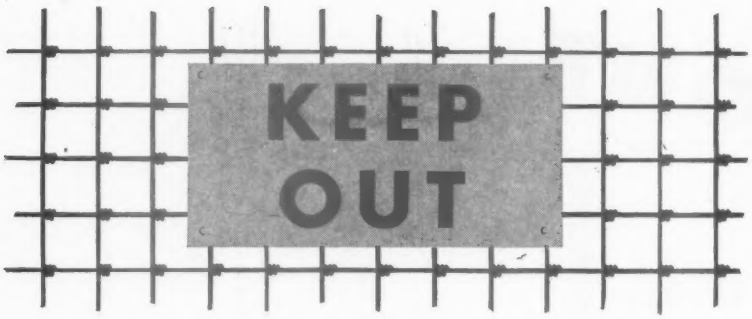

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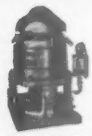

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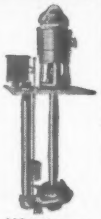

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ROCKY MOUNTAIN

Test Opens Tensleep Pay in Bailey Field

DENVER. — Sinclair - Wyoming Oil Co. chalked up a discovery in the Tensleep in its 3 Bailey unit, NW NE NE 21-26n-89w, Bailey field, Carbon County, Wyoming, which swabbed 57 bbl. of oil and 5 bbl. of water in 6 hours, or at the rate of 228 bbl. of oil per day, at 7,320 ft., total depth. It had the top of the Tensleep at 6,966 ft. Gravity of the crude was not reported, but in the Carbon County field it generally runs much higher than in the Big Horn Basin area. The field lies about 3 miles southeast of the Wertz dome, also operated by Sinclair, where the Tensleep crude runs around 35 gravity, and is on the oil pipe line from Lost Soldier to Sinclair. This is the third well drilled, the first, 1 Coffman, was a discovery in the Sundance a year ago and was completed for 381 bbl. natural in 16 hours. A west offset then was drilled to the Sundance and flowed 674 bbl. in 24 hours. The three wells form a triangle offsetting each other with the Tensleep discovery at the top.

Gebo outpost.—Continental Oil Co. 11 Gebo unit, SW SW NW 24-44n-95w, Gebo field, Hot Springs County, which was completed in the Embar at 5,050 ft., total depth, flowing 8 bbl. per hour, is an outpost on the east, extending the proven area 40 acres to the east.

Rangely key well tops sand.—Continental Oil Co. 1 Rooth, NW SW 15-2n-103w, located 1½ miles northwest of the nearest outpost in the Rangely field, Colorado, and an important key well, topped the Weber sand at 6,581 ft., and stopped at 6,596 ft. to run electric survey. It will be drilled a little deeper before running casing. The stratigraphic position of the well improved with depth and the objective was topped a little higher than previous estimates had placed it. The ground elevation is 5,602 ft., which puts the top of the Weber at 979 ft. below sea level, or only 488 ft. lower than the 1 Hagood, 1½ miles to the southeast. Indications for a good producer are favorable. The company has 49,800 acres under lease extending almost entirely around the field just outside what was thought earlier in the development to be the probable productive area. Should the Rooth well come in as a producer, it will mean that the productive area will not only be larger than at first supposed, but that Continental will become an important factor in future development of the field.

Greasewood test on top of sand.—Colorado Unit Corp. 1 Kirchoff, NW NE 11-60n-61w, an outpost northwest of producing wells in the old Greasewood pool, Weld County, Colorado, has reached the top of the Muddy sand and is changing over to cable tools before drilling in. Last reported depth was 6,628 ft. Greasewood produced from the Muddy, a sand with little bottom-hole pressure, and several wells drilled around the producers had good shows in that horizon, but were drilled in with rotary tools and the holes were dry.

New operations.—Only two new operations were reported for the week, both being wildcats in the Cat Creek area, Petroleum County, Montana. Both are to be drilled by William Hanlon, a Cut Bank operator. They are located 4 and 4½ miles southeast of the producers in the newly discovered Ellis sand and may be regarded as important tests which will disclose the areal extent of the recent discovery. One is Hanlon's 1 Government, NE NE SW 6-14n-31e, and the other 1 Northern Pacific, SE SE NE 1-14-30. This brings the locations and drilling wells in the area up to nine.

Completions.—Fifteen wells were completed in the Rocky Mountain area, of which 10 were oil wells with initial production of 1,146 bbl., one was a small gas well and four were dry holes. Colorado had

(Continued on page 122)

CALIFORNIA

Potential Producer Seen in Standard's McKittrick Test

LOS ANGELES.—On the basis of a formation test, Standard Oil Co. of California should complete shortly what may prove to be an important well in the Cymric section of the McKittrick field.

Standard's potential producer is 33 Weston in Section 26-29s-21e, and if successfully completed it will extend the limits of the so-called Oceanic sand which is the probable equivalent of the Belridge 64 sand, a productive pay in adjacent fields, notably at north Belridge.

Standard 33 Weston flowed at a daily rate of 2,500 bbl. on a formation test at 4,939-58 ft. Gas reached the surface in 1 minute and clean 27-gravity oil in 2 minutes. Since conclusion of the formation test, Standard has drilled ahead to 5,017 ft. and is now making a production test of the entire interval.

This well is in the area proved by Union Oil Co. several months ago, and a successful completion in the Oceanic zone might tend to indicate a uniform accumulation extending northwestward from the Union area to that found by Independent Exploration Co. approximately ½ mile away. Standard 33 Weston found the base of the Etchegoin wet at 3,440-95 ft. and a formation test of the Phacoides at 4,420-50 ft. resulted in the recovery of some gassy, oily mud and salt water.

Correlation work is difficult in this area as there is a lack of uniformity in subsurface formations across Sections 21, 22 and 26. So far three sands have been found productive in the Cymric area, but there is no continuity along or across the probable axis of the fold. Irregularity of sands indicate major faulting and rapid lithologic changes. To further complicate matters at Cymric, Honolulu Oil Corp. is preparing to test the Carneros sand of Miocene age which has not yet been found productive, and Superior Oil Co. is preparing to test the Point of Rocks formation of Eocene age. Oil sand has been cored in both zones although Superior 67-22 Woody in Section 22-29s-21e, at 5,530 ft. appears to show more kick. The Carneros sand has been barren in some wells and absent in others, and its importance from a production standpoint is conjectural.

The Navy Department has successfully completed 42-29-R in about the center of the Hillcrest section of the Elk Hills field and may have proved this heretofore untested section of the field as highly productive. This new well was brought in under a natural flow from the Stevens oil sand of Miocene age, but no data have been released with respect to production. This outpost is in Section 29-30s-23e, and was finished at 5,726 ft.

Southeast of this new well, and between the new discovery and the older section of the field, the Navy is drilling two deep tests in Section 34-30s-23e. Both of these deep tests are stratigraphically deeper than the discovery well, 42-29-R, indicating the probability that the discovery in the Hillcrest area is a new development. If this proves to be a separate accumulation, it will greatly augment the Navy's oil reserve at Elk Hills.

Status of Tide Water Associated Oil Co.'s deep test in the Kern River field, 154 Luck, Section 30-28s-28e, is obscured by lack of data on a production test made several days ago. This deep test had cored an oil sand in the Eocene and reacted favorably on a formation test.

Richfield Oil Corp. appears to have defined the southeastern limits of production in the Bandini district of Los Angeles Basin as the company suspended drilling operations on 1 Simmons in Section 15-2s-12w at 8,024 ft. This well logged top of the Miocene at 7,522 ft. Richfield's 1 Vail in Section 16-2s-12w, south of the Union Pacific discovery well, is drilling within 200 ft. of the anticipated top of Miocene. Richfield is preparing to recomplete 1 Union Pacific in Section 9-2s-12w and is retesting the shoe of the 8⅝-in. water string at 8,561 ft. Ohio Oil Co. will drill its second test in the Gardena district northwest of its initial wildcat which showed oil but also too much water.

New locations this week were slightly lower than total completions. The 32 new locations made this week, however, included 12 at Wilmington, some of which will not be started immediately. These 12 locations were made by Continental Northern Corp. 5; Continental Southern Corp., 5, and Richfield Oil Corp. 2. Drilling operations during the past 2 months have been running around 230 drilling strings in operation, having declined from a high of 281

(Continued on page 122)

MISSISSIPPI

Fayette Field Has Two Possible New Producers

JACKSON.—Humble Oil & Refining Co. 1 S. Hirsch Co., Inc., located 1,445 ft. south of the north line and 4,775 ft. west of the east line of 15-9n-1e, in the Fayette field in Jefferson County, flowed 92 bbl. of oil in 24 hours through ⅛-in. tubing choke. Operators squeezed perforations, perforated at 9,667-70 ft., and swabbed. Wash water and oil flowed for 21½ hours, then packer failed. Operators pulled tubing, perforated at 9,667-77 ft., and are preparing to test.

A possible second producer for the field is Humble B-1 M. R. Smith, located 1,975

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ft. from south line and 2,275 ft. from west line of 16-9n-1e, which flowed an estimated rate of 435,000 cu. ft. of gas with 16 bbl. of condensate in 24 hours. Operators killed well, set retainer at 9,721 ft. and squeezed. A drill-stem test at 9,725 ft. recovered 340 ft. of water cushion, 300 ft. of gas-cut mud, and 240 ft. of mud and sand. Retainer was set at 9,725 ft., perforations were squeezed and operators are waiting on cement.

MISSISSIPPI WILDCAT FAILURES

Jeff Davis County: Humble 1 Barnes et al, 450 ft. south and 660 ft. west of NE corner of SE 24-7n-18w, dry, TD 7,369 ft. in salt.

Madison County: Carter 1 Griffin C-138, 660 ft. south and 645 ft. west of NE corner of NE NW 25-11n-3e, dry, TD 5,205 ft., Wilburn sand 5,026 ft.

ALABAMA WILDCAT FAILURE

Clarke County: C. V. Carey et al 1 Hill, 1,129 ft. south and 330 ft. west of NW corner of 27-9n-1e, dry, TD 5,440 ft.

KANSAS

Pratt County Wildcat To Perforate Lansing

J. M. HUBER CORP. and Paul Hatfield 1 Shanely, CSL NE NE 30-27-13w, wildcat in Pratt County, is planning to cement perforations in the Arbuckle, and perforate the Lansing. Perforations in the Arbuckle at 4,448-52 ft. showed 10 bbl. of oil and 40 bbl. of water, but after acid treatment, the oil decreased to 7 bbl. and the water increased to 83 bbl. Both tests lasted 8 hours.

Continental Oil Co. 1 Skinner, SE NE NE 33-31-15w, a wildcat southwest of the Skinner pool of Barber County, had the Lansing at 4,152 ft., Mississippi lime at 4,697 ft., Viola at 4,902 ft., Simpson at 5,048 ft., and Arbuckle at 5,143 ft. Casing was set at 4,845 ft., and perforated opposite the Mississippi. This zone tested 2,260,000 cu. ft. of gas. The well was killed and the hole plugged back to 4,780. The Lansing was perforated at 4,432-4,500 ft. for no show, and perforations at 4,296-4,326 ft. yielded 1,200 ft. of water in 4 hours. Perforations have been squeezed and further testing will be done in the Lansing.

Completions for the week totaled 36, including 13 oil wells, 4 gas wells, and 19 dry holes, one of which was a water-input well. Seven wildcats were completed, all dry.

KANSAS WILDCAT FAILURES

Barber County: N. A. Hershfield 1 Wolf, NE NE SW 19-30-11w, dry, TD 4,965 ft., Arbuckle 4,896 ft.

Clark County: Helmerich & Payne 1 Yeoman, NW NW SE 3-31-21w, dry, TD 6,433 ft., Arbuckle 6,375 ft.

Cowley County: Consolidated Gas Utilities 1 Mendenhall, NW NW 31-31-7e, dry, TD 3,270 ft., Arbuckle 3,266 ft.

McPherson County: Don T. Ingling 1 Simpson, NW NW NE 4-21-1w, dry, TD 3,012 ft., Mississippi lime 2,943 ft.

Rice County: Ed Swearer et al 1 Ross, SE SE NW 23-19-8w, dry, TD 3,617 ft., Arbuckle 3,585 ft.

Sheridan County: Fred Anshultz 1 Webber, NE NE SW 21-7-26w, dry, TD 4,562 ft., Arbuckle 4,518 ft.

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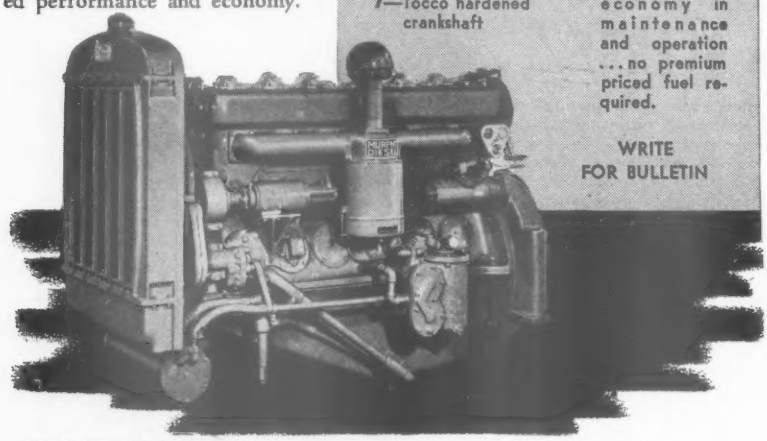

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OKLAHOMA

Good Show in Earlsboro Reported in Seminole County

ONE of the outstanding tests in Oklahoma during the past week was the James Miller et al 1 Stringfellow, SE SW SE 10-10n-6e, Seminole County, which obtained a good show in the Earlsboro sand. The 1 Stringfellow was originally drilled by other operators to the Cromwell sand where it tested dry. Miller and two other operators took over the well and retested to the Cromwell. Although an electric survey indicated a show in the Earlsboro, they did not test, and after a second abandonment, Miller induced the present operators to join him in setting pipe and retesting the possible show.

Five-inch casing was set at 3,460 ft. and perforated with 40 holes from 3,375-92 ft., and tests showed rotary mud and oil and was swabbed clean, making clean oil. When the hole filled up 2,000 ft. with clean oil, work was halted to set tanks and make connections for pipe line. The 1 Stringfellow is in the Keokuk area of northern Seminole County.

The California Co. has announced location for a new test south of Burneyville in southern Love County. Projected as an attempt to extend the Sivells Bend pool of Cooke County, Texas, into Oklahoma, the wildcat is the 1 Wright, NE NW 13-8s-1w. A similar test is to be drilled in 21-7s-1w, by W. F. Turner of Ardmore.

OKLAHOMA SUCCESSFUL WILDCATS

Creek County: New gas field—Davon 1 McVey, NE NE NW 29-15n-7e, 1,020,000 cu. ft. of gas from Prue at 2,860-2,915 ft., TD 2,915 ft., Cleveland 2,060 ft., Oswego 2,835 ft., Prue 2,858 ft.

McClain County: New oil pool—Carter 1 Mottinger, NW NW 5-6n-3w, flowed 687 bbl. of 40.7-gravity oil from Bromide sand at 10,833-11,020 ft., TD 11,237 ft., Viola 10,394 ft., Bromide dense 10,695 ft., Bromide sand 10,833 ft.

Payne County: New gas field—Home Gas 1 State, NW NE SW 36-18n-4e, 4,500,000 cu. ft. of gas from Bartlesville at 3,690-3,705 ft., TD 3,705 ft., Red Fork 3,560 ft., Bartlesville 3,690 ft.

Pottawatomie County: New oil pool—J. F. Smith 1 Kerker, SW SE NW 3-7n-3e, flowed 50 bbl. from Booch at 4,546-63 ft. TD 4,925 ft., Hunton 4,536 ft., chert 4,540 ft., Booch 4,545 ft.

Stephens County: West Marlow extension—Sohio 1 Illie, SW SE SW 17-2n-8w, flowed 38 bbl. from sand at 6,748-6,840 ft., TD 6,980 ft., Canyon 6,350 ft., sand 6,758 ft.

OKLAHOMA WILDCAT FAILURES

Caddo County: J. E. Trigg 1 Smith, SE SE NW 19-6n-9w, dry, TD 6,200 ft. in Permian.

Cotton County: McCashland 1 Nobahnuch, NE NE NE 3-35-12w, dry, TD 3,299 ft., Arbuckle 3,224 ft.

Johnston County: Mid-Continent 1-A Bates, NW NE SW 28-45-6e, dry, TD 2,820 ft.

Lincoln County: Williams Brothers 1 Chandler, NW NW SE 27-14n-3e, dry, TD 5,222 ft., Wilcox 5,191 ft.

Logan County: Renco and Superior 1 Johnson, NW SW SW 12-15n-4w, dry, TD 6,781 ft., second Wilcox 6,742 ft.

Pawnee County: J. E. Trigg et al 1 Donahoe, NW SW NW 34-23n-3e, dry, TD 4,586 ft., Arbuckle 4,350 ft.

J. E. Trigg et al 1 Gilchrist, SE SW SE 5-22n-4e, dry, TD 4,115 ft., Wilcox 4,112 ft.

Seminole County: Mealy-Wolf and Wickers 1 Wilson, NE SW NW 6-8n-7e, dry, TD 4,081 ft., Hunton 4,035 ft.

C. L. Carlock 1 Orwig, SW SE NE 6-8n-7e, dry, TD 4,081 ft., Hunton 4,070 ft.

Stephens County: Texas 1 Neal, SW SW SW 22-1n-4w, dry, TD 1,175 ft.

LA.-ARK.

Caddo Parish Wildcat May Extend Longwood Pool

SHREVEPORT. — A possible south extension to the Longwood pool is J. R. Querbes et al 1 Mitchell estate, wildcat in NW NW 8-18n-16w in Caddo Parish. Oil was swabbed at the rate of one bbl. per hour from perforations at 5,660-65 ft. Operators are now testing. Total depth was 6,306 ft.

Completions numbered 15 in North Louisiana this week. Ten of the completions were oil, three gas and two dry. There were no wildcats.

In the Arkansas fields, three completions were announced. One oil well was completed in the Atlanta pool and the other two completions were dry.

NORTH LOUISIANA WILDCAT FAILURE

Tensas Parish: E. C. Johnston 1 Sawyer, 2,150 ft. south and 45 ft. east of NW corner of 8-13n-14e, dry, TD 7,686 ft.

CANADIAN FIELDS

Official Figures Give Data On Recent Alberta Tests

CHATHAM. — Official figures of recent Alberta completions follow:

North Turner Valley. — Royalite-Lowery 3, LSD 4, 11-20-3w5, Madison 8,308-8,550 ft., 347 bbl. 40°-gravity oil with 412,000 cu. ft. gas.

North Central Turner Valley.—Royalite Oil 84, LSD 15, 2-20-3w5, Madison 7,426-7,661 ft., 234 bbl. 40°-gravity oil with 354,000 cu. ft. gas.

West Central Turner Valley.—Pacific Petroleum 9, LSD 11, 35-19-3w5, Madison 8,346-8,518 ft., 355 bbl. 40°-gravity oil with 420,000 cu. ft. gas.

Taber.—Taber-Province 41-22-A, LSD 2, 22-9-17w4, TD 3,199 ft., 50 bbl. 26° gravity.

Steveville. — In the Steveville - Princess field, eastern Alberta, P.S.&D. 1, LSD 2, 8-20-12w4, failed to develop production in the Blairmore-Basal Colorado formation, and will likely be deepened to test the Devonian limestone.

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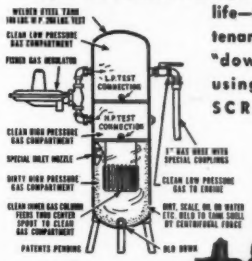

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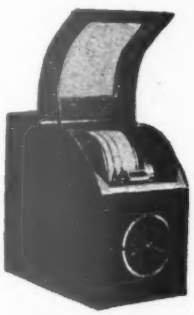

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Among the

Drilling Contractors

C. E. O'Neal, Evansville, Ind., will drill L. A. Plumb and John Kabana 1 Coleman commission, SW SW NW 7-2s-9w, in Gibson County, Indiana.

S. D. Jarvis Drilling Co., Albion, Ill., will drill Jarvis Bros. and Marcell, Inc. 1 Watson, NW NE SW 4-12n-9e, in Coles County, Illinois.

F. J. Fleming will drill Ashland Oil & Refining Co. 1 King, 1-O-22, in Henderson County, Kentucky.

C. E. O'Neal, Evansville, Ind., has the contract for H. H. Weinert 1 Union Trust Co., 19-O-18, in Union County, Kentucky.

Garner Drilling Co., Casey, Ill., will drill two tests for Central States Oil Corp. They are 4 Blackburn, 330 ft. from the north and west lines of NW SW 20-6s-13w, and 5 Blackburn, 990 ft. from the north line and 330 ft. from the east line of NE SE 19-6s-13w, both in Posey County, Indiana.

C. H. Holland, Princeton, Ind., is the contractor for Kirk D. Holland B-2 Kime, 330 ft. from the north line and 1,310 ft. from the east line of NE of fractional NE 33-1n-9w, in Pike County, Indiana.

Conway Drilling Co. has the contract for Fohs Oil Co. 4 Lightsey, 330 ft. north and east of SW corner of NE SW 18-1n-13e, in the East Heidelberg field, Jasper County, Mississippi.

Hewgley Drilling Co. will drill I. P. LaRue 1 Weeks, 425 ft. south and 550 ft. east of the NW corner of SE NE 20-15n-5e, a wildcat in Holmes County, Mississippi.

B. M. Heath, Carmi, Ill., will drill three tests for C. A. Lynch in Posey County, Indiana. They are 2 Vail, 950 ft. from the south line and 800 ft. from the west line of SW SW 14-5s-14w; 5 Vail, 800 ft. from the north line and 150 ft. from the west line of NW NW 23-5s-14w; and 6 Vail, 1,220 ft. from the north line and 610 ft. from the west line of NW NW 23-5s-14w.

George & Wrather, Mt. Carmel, Ill., has been given contract for four tests to be drilled in Gibson County, Indiana, for Cherry & Kidd. The tests are 5 Woodson, 990 ft. from the north and west lines of NW NW 19-2s-11w; 6 Woodson, 330 ft. from the north line and 990 ft. from the west line of NW NW 19-2s-11w; 7 Woodson, 990 ft. from the north line and 330 ft. from the west line of NW NW 19-2s-11w; and 8 Woodson, 330 ft. from the north and west lines of NW NW 19-2s-11w.

General Drilling Co., Los Angeles, has been incorporated for continuing the drilling-contractor business previously operated as a copartnership. Lloyd J. Seay is president; H. K. Burns, vice president, and Walter Parker, secretary-treasurer.

Stansbury, Inc. has been organized from the partnership of Stansbury & Stansbury, California drilling contractors, and offices will be continued at Bakersfield. M. H. Stansbury and B. J. Stansbury, the partners, are officers of the new corporation.

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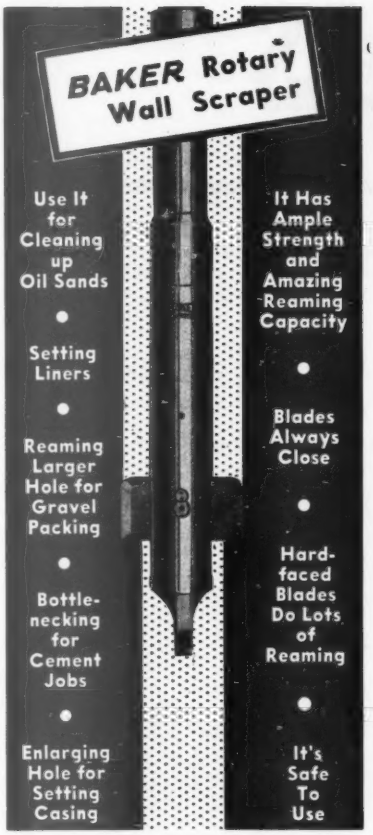
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CALENDAR

February

American Welding Society, national meeting, Hotel Cleveland, Cleveland, February 4-7.

Iron and Steel and Institute of Metals divisions, American Institute of Mining and Metallurgical Engineers, national meeting, Statler Hotel, Cleveland, February 4-8.

American Society for Metals, annual convention (postponed from 1945), Statler Hotel, Cleveland, February 4-8.

A. G. A. Gas Production Research Committee, Headquarters, February 7.

FPC regional hearing in natural-gas investigation, Buena Vista Hotel, Biloxi, Miss., February 11.

FPC regional hearing in natural-gas investigation, courtroom Circuit Court of Appeals, Chicago, February 19.

American Society for Testing Materials, spring meeting, Pittsburgh, February 25-March 1.

Exposition of Chemical Industries, twentieth exposition, Grand Central Palace, New York, February 25-March 2.

March

Southern California Meter Association, nineteenth annual Hi-Jinks, Long Beach, Calif., March 2.

Society of Automotive Engineers, German engineering evaluation meeting, Rackham Educational Memorial, Detroit, March 4.

Oklahoma Utilities Association, annual convention, Biltmore Hotel, Oklahoma City, March 11-12.

Southern Gas Association, annual convention, Galveston, March 21-22.

Western Petroleum Refiners Association, annual meeting, Blackstone Hotel, Fort Worth, March 25-27.

American Gas Association, conference on industrial and commercial gas, Commodore Perry Hotel, Toledo, March 29-30.

April

FPC regional hearing in natural-gas investigation, House of Delegates Chamber, State Capitol Building, Charleston, W. Va., April 2.

American Association of Petroleum Geologists, annual meeting, Stevens Hotel Chicago, April 2-4.

American Chemical Society, annual general meeting, Atlantic City, April 8-12.

Natural Gasoline Association of America annual convention, Baker Hotel, Dallas April 17-19.

National Petroleum Association, semiannual meeting, Hotel Cleveland, Cleveland Ohio, April 18-19.

Southwestern Gas Measurement Short Course, Norman, Okla., April 23-25.

Independent Petroleum Association of America, midyear meeting, Houston, April 29-May 1.

May

Pennsylvania Gas Association, Galen Hall, Wernersville, Pa., May 7-9.

Natural Gas Department, American Gas Association, annual spring meeting, Hotel Gibson, Cincinnati, May 7-8.

National Association of Corrosion Engineers, annual meeting, President Hotel Kansas City, Mo., May 7-9.

June

Society of Automotive Engineers, semiannual meeting, French Lick, Ind., June 2-7.

American Society for Testing Materials annual meeting, Buffalo, June 24-28.

November

Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa, November 7-8.

1947

May

International Petroleum Exposition, Tulsa, May 17-24.

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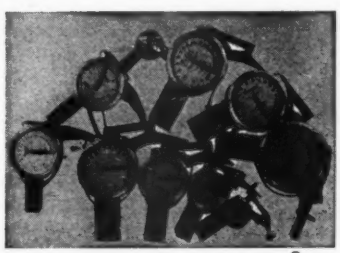

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PERSONALS

Mid-Continent Head Began Oil Career 30 Years Ago

THE election last week of Frank M. Porter as sixth president of the Mid-Continent Oil and Gas Association came only a few days before this widely known industry figure marked the 30th anniversary of his entrance in the oil business.

Porter's first employment in the petroleum industry was at Ardmore, Okla., February 1, 1916, when he went to work for Dundee Petroleum Co. At the present time, he is owner of Fain-Porter Drilling Co., Oklahoma City, holds considerable royalty and production interests and has long been prominently identified in leading industry trade associations.

After 2 years with Dundee, Porter was employed by Wirt Franklin, and in 1927 became vice president in charge of production of the newly formed Wirt Franklin Petroleum Corp. In 1933 he was appointed receiver for the Franklin corporation and for Cromwell-Franklin Oil Co. After the receivership was terminated he continued as general manager of both companies. In 1939 he organized the Fain-Porter Drilling Co. with the late Leslie Fain, and after Fain's death in 1944 became sole owner.

Porter is now serving his third term as president of the Kansas-Oklahoma division of the Mid-Continent association.

W. L. Connelly, board chairman of Sinclair Prairie Oil Co., has been appointed a member of the American Petroleum Institute's general committee on production. Connelly replaces **C. H. Kountz,** vice president of Sinclair Refining Co., pipe-line department, who resigned to become a member of A.P.I.'s newly organized transportation division.

Clarence F. Hansen, formerly chief engineer of Standard Oil Co. of California's manufacturing department, has been elected president of the American Gilsonite Co., jointly owned by Standard of California and Barber Asphalt Corp.

P. S. Magruder, who was elected to the board of directors of General Petroleum Corp. late in 1945 and appointed manager of the company's manufacturing department, has been elected a vice president of the corporation and will continue to head the manufacturing department.

J. A. Riise, former Kansas production superintendent for Sohio Petroleum Co., has been transferred to Oklahoma City to become Oklahoma and North Texas district superintendent, succeeding **Vernon E. Holmes,** who will be manager of industrial relations of Sohio's petroleum division. Two new employes in the company's Oklahoma City office are **Robert L. Schick,** junior petroleum engineer, and **James M. Gibson,** engineer trainee.

Fred H. Stover, Hollywood, Calif., has been awarded a bronze medal and $75 monthly disablement benefits by the Carnegie Hero Fund Commission for running through burning oil in an attempt to save a fellow worker in a Pennsylvania oil-field explosion.

Ben G. Post, Jr., released from the Army, will resume his duties as chemist for Shell Oil Co., Inc., at Houston. He served 4 years in the chemical warfare section and held the grade of major.

Edward F. Morrill has been named vice president of the Sohio Pipe Line Co. and will act as assistant manager of operations. **Richard C. Sauer,** manager of crude oil and refined products distribution for Sohio Petroleum Co., who served during the war as assistant director of transportation and supply of the Petroleum Administration for War, has been elected vice president of the company.

L. L. McDonald has returned to Pure Oil Co. as assistant production engineer, southwestern producing division, after 3 years service in the Army during which he served in Europe as a field artillery officer.

George P. Rosser has been appointed assistant manager of the Kansas City division of Ethyl Corp., and **Gerald A. Lofquist** has been made assistant manager of the Chicago division. Rosser, recently released by the Army with the rank of lieutenant colonel, joined Ethyl in 1930 and served as assistant manager of the Atlantic division before entering the service in 1942. Lofquist became associated with Ethyl in 1939 as a field engineer in Illinois and has been safety engineer with the Chicago division for the last 3 years.

G. P. ROSSER

G. A. LOFQUIST

J. F. Neill has returned to the Midland, Tex., office of The Texas Co. as assistant drilling foreman for the West Texas-New Mexico district following his release from the Army as a lieutenant colonel in the Corps of Engineers. Others rejoining The Texas Co. organization in the Midland area are **H. D. Murray,** petroleum engineer released from the Army Ordnance Department in the grade of captain, **B. E. Hull, Jr.,** petroleum engineer separated as an Army Air Forces captain, **B. J. Miller,** petroleum engineer who served in the Naval Air Corps as a senior grade lieutenant, **Joseph J. Fasy,** scout separated as an Army captain, and **Maurice W. Kennedy,** leaseman in the district land office who was released as a captain in the Infantry.

John Christopher, petroleum engineer for Hogan Petroleum Co., has been appointed general manager of the company.

L. W. Elliott, vice president and director of the Standard-Vacuum Oil Co., who recently returned from the Netherlands East Indies where the company's war-damaged refining

plants were inspected, left New York, January 18, for Europe.

James L. Vaughn has been promoted from department manager of operations for Shell Oil Co., Inc., at its Dominguez refinery to chief technologist at the Martinez refinery.

Raymond W. Parker, who was assistant chief engineer of the manufacturing department of Standard Oil Co. of California, has been appointed chief engineer of the department in San Francisco.

Walter L. Faust, vice president of Socony-Vacuum Oil Co., has been named a vice president of New York's Beekman-Downtown Hospital.

George L. Nye, petroleum engineer and geologist who was head of the oil and gas department of the City National Bank, Houston, has been elected vice president of the bank. He formerly was chief engineer and assistant superintendent of production in the Mid-Continent division of Tide Water Associated Oil Co.

Frank W. Evans has rejoined Shell Oil Co. at Houston as senior geologist after more than 3 years service in the Navy during which he specialized in geologic interpretations of aerial photographs and operated photo laboratories on Guadalcanal and Okinawa with the rank of lieutenant commander.

T. A. Link, chief geologist on the Canol project during the war, has been named chief geologist for Imperial Oil, Ltd., succeeding **O. C. Wheeler,** who recently became a director of International Petroleum Co., Ltd.

Levi F. Shiplet has been appointed general superintendent of production of the West Texas Division of The Texas Co. with headquarters in Midland. Shiplet formerly was district superintendent of the company's West Texas-New Mexico district where he will be succeeded by **C. I. Holliman,** a former company employe who was recently separated from the army as a lieutenant colonel.

M. H. Robineau, president of the Frontier Refining Co., will take over direct supervision of the production division with headquarters at Denver, succeeding **Dr. Ben H. Parker** who recently was elected president of the Colorado School of Mines. Robineau will divide his time between the Cheyenne and Denver offices. He will be assisted in the production department by **Robert McMillan,** who was Dr. Parker's assistant. **H. E. Armitage,** vice president in charge of administration, also will be transferred from Cheyenne to Denver. The general offices will remain in Cheyenne.

Jacob France, president of the Mid-Continent Petroleum Corp., is one of eight newly elected members of the business advisory council of the Department of Commerce.

Ralph D. Curtis has joined the Earlougher Engineering Co., of Tulsa as valuation-appraisal and pressure-maintenance engineer. Curtis, formerly production superintendent in Kansas for the Barnsdall Oil Co., was released from the Army in May of last year with the grade of lieutenant colonel after serving as chief of the Mediterranean section, Theatres division, Army-Navy Petroleum Board.

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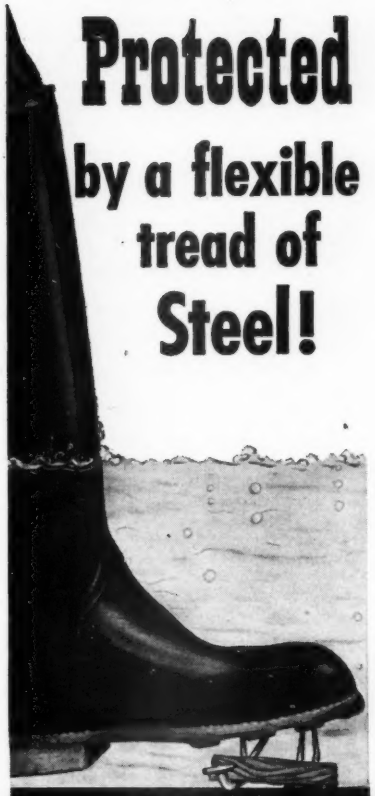

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Illinois Fields

(Continued from page 111)

NW NW SE 4-2n-6e, is testing the McClosky at 2,978-84 ft., total depth 2,988 ft. It is swabbing at the rate of 15 bbl. of oil an hour following an acid treatment of 4,000 gal. The 1 Given is about 3 miles southwest of Flora, and the same distance from other producing wells.

Thirty-three new tests were reported for the week, but only four of these were wildcats. Ten of the first reports were in Coles County where the Mattoon field is still undergoing an extensive development program.

ILLINOIS SUCCESSFUL WILDCAT

Clay County: N. V. Duncan 1-A J. Leonard, SE SW NW 2-4n-7e, pumped 146 bbl. oil and 7 bbl. water, 50-qt. shot 2,552-77 ft., Cypress sand 2,554-76 ft., TD 3,007 ft.

ILLINOIS WILDCAT FAILURES

Clark County: C. R. Craft 1 Madlem, SW SW SW 29-9n-14w, dry at 2,560 ft.

Clay County: W. W. Shaffer 1 Stoates, SE SE SE 23-5n-7e, dry at 2,871 ft., Glen Dean 2,338 ft., Golconda 2,406 ft., Cypress sand 2,524 ft., Paint Creek 2,623 ft., Benoist 2,672 ft., Renault 2,736 ft., Aux Vases 2,760 ft., Ste. Genevieve 3,021 ft., Rosiclare 3,040 ft., Fredonia 3,079 ft., McClosky 3,098 ft.

J. J. Lynn 1 J. Hunley, SE SE NW 35-3n-7e, dry at 3,131 ft., Glen Dean 2,519 ft., Golconda 2,590 ft., Barlow 2,670 ft., Cypress sand 2,730 ft., Paint Creek 2,899 ft., Renault 2,956 ft., Ste. Genevieve 3,021 ft., Rosiclare 3,040 ft., Fredonia 3,079 ft., McClosky 3,098 ft.

Coles County: Nation Oil Co. 1 W. M. Elliott, NE NE SW 27-12n-8e, dry at 1,530 ft., limestone 878 ft., sand 1,113 ft., limestone 1,327 ft.

D. S. Wright 1 Taylor, NE NW SE 33-14n-10e, dry at 510 ft., Penn. sand 164 ft., Osage 498 ft.

Nation Oil 1 Donnell, SE SE SW 34-13n-7e, dry at 2,062 ft.

Randolph County: J. W. Osteen 1 F. A. Roth, SW SW NE 4-7s-7w, dry at 1,756 ft.

Richland County: Superior 1 Buckels, SE SE NW 13-2n-10e, dry at 3,356 ft., Menard 2,417 ft., Tar Springs 2,601 ft., Glen Dean 2,686 ft., Cypress sand 2,874 ft., Benoist 3,025 ft., Renault 3,159 ft., Aux Vases 3,165 ft., Ste. Genevieve 3,209 ft., McClosky 3,271 ft.

Shelby County: T. B. Dirickson 1 H. Hazen, NW SW SW 12-11n-4e, dry at 2,162 ft., Glen Dean 1,644 ft., Cypress sand 1,771 ft., Paint Creek lime 1,869 ft., Paint Creek sand 1,869 ft., Benoist 1,907 ft., Renault 1,935 ft., Aux Vases 1,945 ft., Ste. Genevieve 1,993 ft., Lower O'Hara 2,004 ft., Fredonia 2,056 ft., McClosky 2,062 ft.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, General Land Office, Washington, D. C. Notice is hereby given that sealed bids will be received until noon on Monday, February 18, 1946, for land described herein situated within the known geologic structure of the Ashley Creek gas field, Utah. This land is offered to qualified bidders of the highest cash amounts per acre as a bonus for the privilege of leasing the land under section 17 of the leasing act as amended by the Act of August 21, 1935 (49 Stat. 674, 30 U.S.C. sec 226), in the following parcels, all in T. 5 S., R. 22 E., S.L.M.: Parcel No. 1, sec. 22, NW¼SE¼, S½SE¼, sec. 27, NE¼NE¼, 160 acres. Parcel No. 2, sec. 23, SW¼SW¼, sec. 26, N½NW¼, 120 acres. Parcel No. 3, sec. 25, NW¼NW¼, sec. 26, N½NE¼, 120 acres. Total 400 acres. Bids must be submitted on each parcel separately, but if two or more parcels are awarded to the same bidder they may be included in a single lease. Each bidder must submit with the bid one-fifth of the amount bid in cash, or by certified check made payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease, required under 43 CFR 192.19. The envelopes should be plainly marked "Bid for Parcel No. . . . , Ashley Creek field. Not to be opened before noon, Monday, February 18, 1946." No bids received after the hour fixed herein for the opening of bids will be considered. The remainder of the bonus and the annual rental at the rate of $1 per acre must be paid and a $5,000 corporate surety bond must be furnished by a successful bidder prior to the issuance of a lease. The deposits of the other bidders will be returned upon acceptance of the successful bids by the Secretary of the Interior. The successful bidder will be required to agree not to discriminate against any employee or applicant for employment because of race, creed, color, or national origin, and to require an identical provision to be included in all subcontracts. Bidders are warned against violation of section 59, U. S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids in the discretion of the Secretary of the Interior. Fred W. Johnson, Commissioner.

California Fields

(Continued from page 115)

strings last June. Indications point to a maintenance of present averages unless critical material becomes unavailable.

CALIFORNIA WILDCAT FAILURES

Fresno County, Chowchilla: Continental 1 Miller and Lux, 25-11s-13e, bottomed in barren gray sand, shallow gas sand at Chowchilla was absent, TD 3,985 ft.

Kern County, Ant Hill: Amerada 27-14 Waglay, 14-29s-29e, bottomed in granite basement, no important showings, TD 4,518 ft.

Dagany Gap: Shell 1 U. C., 3-29s-18e, bottomed in gray sand, form. test 1,468-1,577 ft. recovered 1,300 ft. of mud and muddy water with a few oil spots, TD 1,577 ft.

Mount Poso: Maurer and Fisher 3 Jean, 16-26s-28e, bottomed in schist basement, top schist 1,339 ft., Vedder sand of Miocene age barren, TD 1,520 ft.

Mount Poso: Mitchell and Steele 2 S. P., 33-26s-28e, bottomed in hard gray sand, no showings of importance, Vedder sand was barren, TD 1,920 ft.

Sacramento County, Isleton: Shell 2 Staten Island, 13-4n-4e, bottomed in gray sand, no important showings. This wildcat was drilled in search of a commercial gas field. TD 4,502 ft.

Rocky Mountain Area

(Continued from page 114)

only one completion, in the Rangely field, for 528 bbl. in 24 hours. Wyoming had six, of which four were oil wells with initial production of 712 bbl., two were dry holes. Montana had seven completions, of which five were oil wells for 90 bbl., one was a gas well and one was a dry hole. Northwest New Mexico had one completion, a dry hole. Wyoming had three wildcat completions, one a discovery at Bailey, and the other two were failures. One wildcat in Montana and one in northwestern New Mexico were both dry.

WYOMING SUCCESSFUL WILDCAT

Bailey, Carbon County: Sinclair-Wyoming Oil 3 Bailey unit, NW NE NE 21-26n-89w, TD 7,320 ft., flowed 57 bbl. of oil and 5 bbl. water in 6 hours from Tensleep. Tops: Frontier 3,222 ft., Dakota 4,491 ft., Lakota 4,633 ft., Sundance 4,957 ft., Alcova 5,775 ft., Embar 6,656 ft., Tensleep 6,966 ft.

WYOMING WILDCAT FAILURES

Indian Creek, Platte County: Continental Oil 1-X Reno, SW SE SW 1-30n-70w, TD 2,286 ft., cored Madison lime 2,280-86 ft., all horizons dry.

Zimmerman Butte, Hot Springs County: Pacific Western Oil 1 Gov't., approx. SE 35-44n-93w, TD 1,120 ft., swabbed hole dry without show of gas, pulled tubing, found 500 ft. fluid in hole with show of light green oil. Perf. with 22 shots at 1,115-22 ft., bailed dry. After 30 minutes 6 gal. emulsion in hole, 50 per cent light crude, 50 per cent mud and water, small show of gas. Drilled to Morrison sand near Embar discovery, dry.

MONTANA WILDCAT FAILURE

Huntley, Yellowstone County: Farmers Union Central Exchange 1 Farmers Union Central Exchange, SE SE NW 31-2n-28e, TD 4,052 ft., heavy flow of water, probably in the Amsden, dry.

NORTHWEST NEW MEXICO WILDCAT FAILURE

Corona, Torrance County: Dale Resler 1 Nalda, SE SE 27-1n-15e, TD 3,350 ft., in granite, dry.

Kentucky Fields

(Continued from page 112)

pleted Well 5593, Riley Reynolds farm, Floyd County, total depth 3,210 ft., daily open flow of 41,000 cu. ft. in shale, A.S.

Kentucky - West Virginia Gas Co. completed Well 710, F. C. Maynard (O.W.D.D.), Pike County, total depth 3,162 ft., dry.

WESTERN KENTUCKY

OWENSBORO. — Operations have been started at W. L. Lichlyter et al 1 R. A. Hughes, 10-Q-25, an interesting wildcat test in Henderson County. This test is about 2½ miles northeast of the Spotsville field and is believed by many oil men to have a better than average chance of success.

Five completions were reported in Western Kentucky for the week, including three oil wells, one gas well, and one dry hole. Drilling was under way at the end of the week at H. H. Weinert 1 Union County Trust Co., 19-Q-18, new Union County test, and Basin Drilling Co. 2 Carl Smith, 9-P-23, new Henderson County test in the Kasey Club area. Location was also staked for Sinclair Prairie 1 Poole-Cavanaugh Comm., 12-N-23, in Webster County.

INDIANA

EVANSVILLE.—Activity in Indiana was quiet during the past week with only three completions reported, all unsuccessful wildcats. Eight new tests were reported, five in Gibson County and three in Posey County.

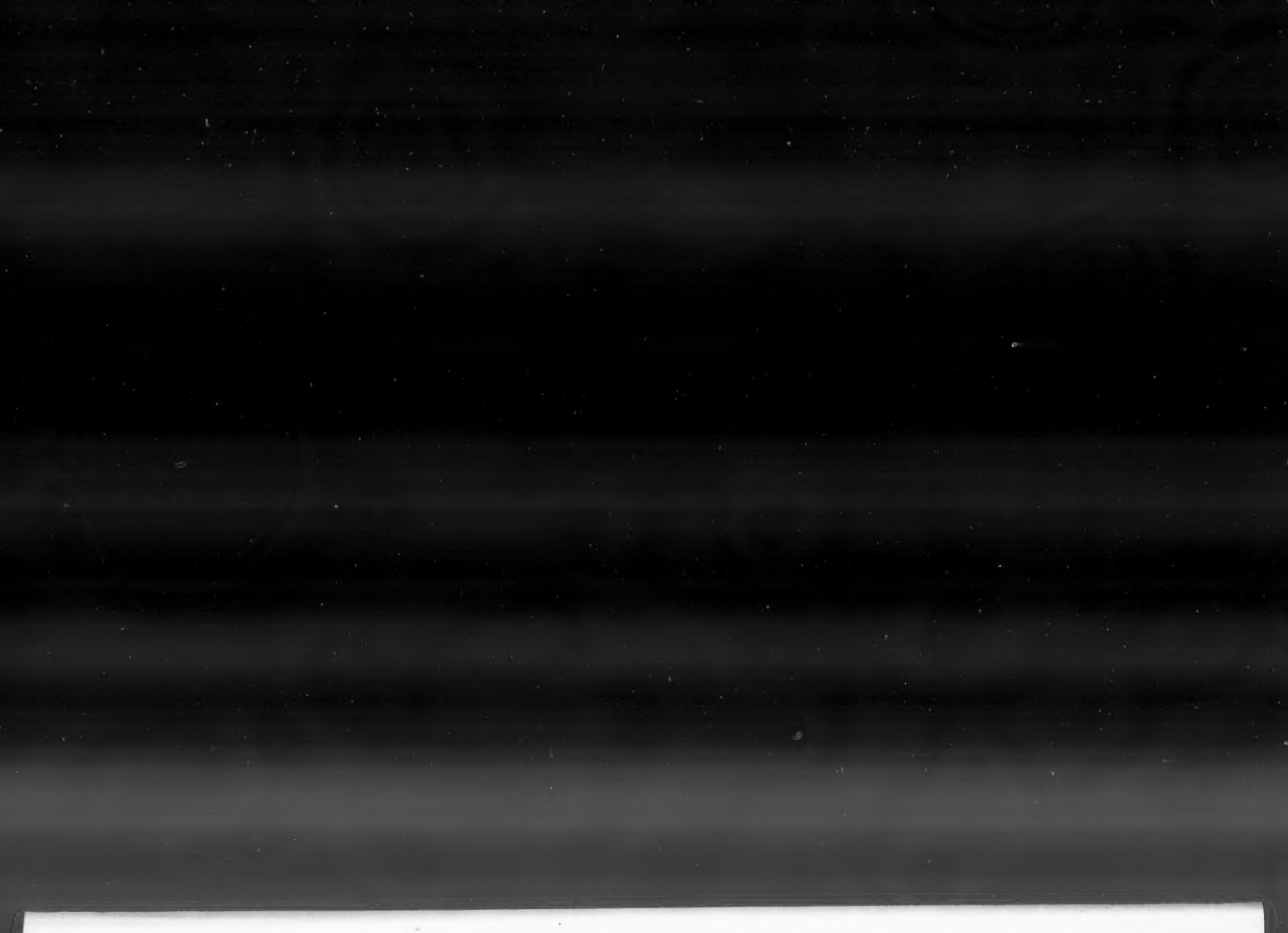
The North Owensville field again received the majority of new tests, with permits issued for four wells in 19-2s-11w. The northern limits of this field are still undefined and wells in this area average from 250 to 900 bbl. daily from the Cypress sand at 1,950 ft., and Benoist sand at 2,075 ft., and the McClosky lime at 2,260 ft.

INDIANA WILDCAT FAILURES

Posey County: F. H. Rhodes 1 M. Schmitz, NW SW SE 33-5s-12w, elev. 412 ft., dry at 2,790 ft., Cypress 2,391 ft., McClosky 2,672-75 ft.

S. C. Yingling 1 Duckworth, SW NW SW 26-7s-14w, elev. 371 ft., dry at 2,736 ft., Menard 1,801 ft., Waltersburg 1,908 ft., Viola 1,972 ft., Glen Dean 2,100 ft., Cypress 2,362 ft., Renault 2,534 ft., Aux Vases lime 2,564 ft., Ste. Genevieve 2,620 ft., McClosky 2,699 ft.

Spencer County: H. L. Lambert et al 1 Bullick, NW SE NE 34-6s-7w, dry at 1,646 ft., Glen Dean 1,117 ft., Golconda 1,206 ft., Ste. Genevieve 1,485 ft., McClosky 1,618 ft.

Magnolia Posts New Prices For Fullerton Crude

DALLAS. — Magnolia Petroleum Co. has posted the following prices on crude at wells from the Fullerton-Ellenburger pool, Andrews County: below 25 gravity, 93 cents per barrel with a 2-cent differential per degree of gravity up to a top of $1.25 for 40 gravity and above. Prices are based on use of 100 per cent tank tables.